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HERIOT (A. D.). **Recent Progress in Codling Moth Control in British Columbia. I. Killing the mature Larva.**—*Sci. Agric.* **22** no. 10 pp. 571–576, 5 refs. Ottawa, 1942.

In view of the very heavy infestation of apples in British Columbia by the codling moth [*Cydia pomonella*, L.], progress reports are given in this and the following paper on attempts to develop methods of supplementing the measures now in use against the young larvae by others against the full-fed larvae and the adults.

In March 1941, during the delayed dormant period, the trunks and main limbs of 30-year-old apple trees that had never been scraped and had suffered an infestation of about 50 per cent. in the previous year, despite spraying with lead arsenate, were sprayed to a height of 8–9 ft. with solutions of 3,5-dinitro-ortho-cresol in oil against the larvae in their cocoons. The solutions contained 2 per cent. dinitro-cresol in diesel oil or 1 per cent. in stove oil or kerosene and were applied at minimum pressure at the rate of 1 gal. to a tree able to bear 40–50 boxes of fruit. The specifications for the dinitro-cresol and the oils are given. Three weeks after they were applied, no living larvae or pupae could be found on the treated portions of the trees, though both were numerous on the controls. The trees in both test and control plots were sprayed four times with lead arsenate against the first generation and once with cryolite against the second. On 22nd July, the average percentages of fruits infested and (in brackets) injured superficially by the first generation were reduced from 9·4 (33) to 1 (10) on McIntosh trees and from 4·1 (27·5) to 0·1 (5·9) on Jonathan trees by the diesel-oil solution ; the corresponding reductions at harvest were from 36 (26·2) to 7·6 (13·5), and from 25 (19·9) to 12·6 (9·8), and the average yield was increased from 26·9 to 32·5 boxes of fruit per tree. The degree of infestation in the other treated plots was midway between those in the diesel-oil and control plots. Spray injury to the trees began to appear three weeks after treatment ; it was much more severe in the plots treated with the 1 per cent. solution in stove oil or kerosene, in which several trees had died by the end of the year, than in that treated with the 2 per cent. solution in diesel oil, in which none died. Damage was largely confined to the cambium at ground level, where the solution had concentrated and persisted, and was apparently due largely to the oil.

In tests on the residual effect of the poison, only 18 of 100 larvae that left the fruit in July and were placed on large branches that had been treated with the diesel-oil solution 100 days before were recovered as living pupae, as compared with 70 of 100 placed on untreated branches. Of 100 larvae introduced into corrugated paper bands that had been treated with the same solution 100 days before, 30 died as larvae and 47 as pupae, and 14 moths that emerged died without ovipositing, whereas only one larva died in untreated bands and the adults that emerged oviposited normally. In bands treated 210 days previously, 48 per cent. of the larvae died, as compared with 0·8 per cent. in controls. When corrugated paper bands were dipped in a water suspension of 2 per cent. dinitro-cresol and allowed to dry, 39 of the 47 larvae introduced into them died within five days and there was no mortality in the controls.

The experiments indicate that, when used as a solvent for dinitro-cresol, a light petroleum fraction such as kerosene (viscosity 32 S.S.U.) is more likely to cause cambium injury than a heavier diesel fraction (viscosity 40–45). As such substances as dinitro-cresol are more soluble in still heavier fractions such as dormant oil (viscosity 110) and in oils of a low degree of refinement, it may be possible to obtain an oil of such solvent power that sufficient poison could be applied to the tree in an emulsion of 10 or 20 per cent. oil in water ; it has been shown that diffusion of the poison from oil to water can be almost completely prevented by acidifying the water. Since experiments have shown that dinitro-cresol acts on the mature larvae as a stomach poison as well as

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by contact, it may be preferable to apply it before they form their cocoons, as they commonly chew and reject bark in doing so. If a deposit of the poison, possibly applied as a suspension in water, could be placed sufficiently far within the crannies of the bark in June or early July, it would provide means of controlling any first-generation larvae that survive the usual sprays, and its residual effect might also give some control of larvae of the second generation in September or October.

DENNYS (A. A.). **Recent Progress in Codling Moth Control in British Columbia. II. Killing the Adult.**—*Sci. Agric.* **22** no. 10 pp. 577–583, 7 refs. Ottawa, 1942.

The results are given of investigations in British Columbia in 1940 and 1941 on the control of adults of the codling moth [*Cydia pomonella*, L.] on apple by means of stomach poisons. Laboratory experiments in which individual moths were offered measured amounts of liquid by means of a syringe showed that they ingested water solutions quite freely, though generally not for two days or more after emergence, and that amounts of up to 0·01 ml., which were taken in 3–5 minutes, were required to satisfy them. Moths fed on molasses-water containing derris powder, quassia extract, phenothiazine, tartar emetic (potassium antimony tartrate), lead arsenate or cryolite were not noticeably affected, but a water solution of 0·02 per cent. 3,5-dinitro-ortho-cresol was obviously lethal, although its effects did not generally appear in less than 24 hours. Sodium-dinitrocresylate solution, which appeared to be more freely imbibed, was somewhat less toxic. Solutions of sodium fluosilicate (0·3 per cent.) and sodium arsenate were definitely toxic. Water that had been sprayed on foliage bearing a dry residue of lead arsenate caused no ill effects, but water on a dry residue of either dinitro-cresol or dinitro-cresol and lead arsenate was toxic and reduced the numbers of eggs laid.

The sprays used in orchard tests included 3·75 lb. lead arsenate, 3 lb. sodium fluosilicate, and a mixture of 4 oz. ammonium dinitrocresylate and 3·75 lb. synthetic cryolite, all per 100 gals. water, but the chief one was sodium dinitrocresylate. It was prepared by adding 4 oz. dinitro-cresol to a solution of 8 oz. sodium carbonate in hot water, and approximately this quantity per 100 gals. was used in most of the sprays, with or without the addition of 2 lb. bentonite.

In tests in which known numbers of moths were caged on sprayed branches, the longevity of both males and females and, particularly, the egg-production were reduced considerably by sodium dinitrocresylate, with or without bentonite and by sodium fluosilicate, but only slightly, if at all, by lead arsenate.

In a field experiment, two acres of 10-year-old McIntosh trees, which had not been sprayed for several years and suffered a complete loss of crop owing to attack by the moth in 1939 and 1940, were treated 11 times between petal-fall and two weeks before harvest with about 5 gals. per tree of the sodium-dinitrocresylate spray, which is believed to be innocuous to the eggs and larvae. The percentages of apples infested on trees receiving this spray with and without bentonite and on unsprayed trees were 1·5, 1·7 and 14·5 on 2nd July (before the second generation hatched) and 24, 20 and 67 at harvest. The size of the apples was apparently affected, since they averaged 82, 72 and 115 per box, respectively. In another orchard in which sprays were applied twice during the flight of first-generation adults in August to determine whether dead moths could be found under the sprayed trees, totals of 36, 46 and 32 were collected between 3rd August and 2nd September under individual trees sprayed with sodium dinitrocresylate, ammonium dinitrocresylate with synthetic cryolite and sodium fluosilicate, respectively, and 4 under an untreated tree ; 18, 19, 22 and 3 of these were females.

At a concentration of 6 oz. dinitro-cresol per 100 gals., sodium dinitrocresylate caused whitening of the margins of the young leaves when applied one week after full bloom, but subsequent applications at 4 oz. per 100 gals. had no apparent effect, and the léaves regained their normal colour after a few weeks. Dinitro-cresol appeared to be more injurious than its sodium salt. Sodium fluosilicate caused considerable foliage injury when applied at 3 lb. per 100 gals., but cage experiments indicated that a concentration of 1 lb. per 100 gals. may be toxic to the moths.

KNIGHT (H.). **Some Observations on Oil Deposit.**—*J. econ. Ent.* **35** no. 3 pp. 330–332, 3 figs. Menasha, Wis., 1942.

The author describes the development of the oil emulsions used as insecticidal sprays from the early stable mayonnaise-type, which probably released not more than 10 per cent. of its oil content on application. In 1924, the quick-breaking type (tank-mix) produced in the spray tank by the addition of small amounts of emulsifying agent to the water phase, which gave up 30–40 per cent. of its oil content to the sprayed surface, was introduced, and in 1930, emulsible oils, in which a small amount of oil-soluble emulsifying agent had been incorporated and which deposited about 30 per cent. of their oil content, came into use. Later it was found that the employment of suitable electrolytes, especially in the water phase, produces marked changes in the emulsion, causing the oil globules to cluster (so-called flocculation), and increases the percentage of oil deposited to about 60. If the amount of electrolyte is increased, the emulsion enters a state of unstable equilibrium and is at the point of greatest oil deposit (approximately 70 per cent.). At this stage it is not inverted and can be dispersed in the spray tank with ordinary agitation, but unless checked at this point, complete inversion rapidly ensues, and the emulsion of water in oil coagulates and rises to the surface, clogging the equipment, and cannot be dispersed or used for spraying. The process is essentially the same when a solid, such as lead arsenate, is suspended throughout the water phase of the emulsion ; certain electrolytes cause it to leave the water phase and become preferentially wet by oil, and as long as inversion does not occur, a heavy and continuous film can be built up on fruit and foliage. The author considers that the terms inverted mixture and inverted emulsion, applied to sprays, are misleading.

GUNTHER (F. A.) & EBELING (W.). **The Determination of Kerosene Oil Deposit on Citrus Leaves.**—*J. econ. Ent.* **35** no. 3 pp. 333–339, 4 figs., 10 refs. Menasha, Wis., 1942.

In order to evaluate a particular toxic agent dispersed or dissolved in oil and applied to *Citrus* trees, it is necessary to correlate the amount of the oil deposited by the spray emulsion with the insecticidal data, as differences in effect on insects and tree may be due to variations in the amount of oil deposited rather than to differences in toxicity. A method of determining the total amount of kerosene deposited on leaves and the apparatus used are described in detail, and typical results obtained when the method was applied to field tests are recorded. It involves the selective chemical disintegration of the leaf cells by means of a solution of sulphuric acid containing small quantities of nitric acid and aluminium sulphate, accompanied by steam distillation of the stable oils present ; it has been standardised and has proved to be rapid, accurate, reproducible and applicable to the determination of kerosene deposits, regardless of the extent to which penetration has taken place. The only important source of error is that incurred if the time of distillation is not standardised, and methods of ascertaining the necessary period are shown. The results of experiments with known samples indicate that the kerosene inside the leaf tissue exists in solution in the natural waxes and oils of the leaf and not as discrete, homogeneous globules between or within the cells.

Although the method has been applied chiefly to determinations of kerosene deposited on *Citrus* leaves, sufficient tests have been made with a light-medium spray oil (viscosity 70 secs. Saybolt at 100°F., unsulphonatable residue 90 per cent.) to indicate that the method is applicable, but that higher consistent yields can be obtained with a longer period of distillation. Further investigations are being made on recovering light-medium and heavier oils from plant tissues and also kerosene from twigs, bark and fruit.

Yust (H. R.), Nelson (H. D.) & Busbey (R. L.). **The Stupefaction of California Red Scale with sublethal Dosages of Hydrocyanic Acid.**—*J. econ. Ent.* **35** no. 3 pp. 339–342, 4 refs. Menasha, Wis., 1942.

The following is substantially the authors' summary. In laboratory fumigations of non-resistant mature females of *Aonidiella aurantii*, Mask., with hydrocyanic acid gas at 59°F., exposure to a sublethal dosage for 10 minutes immediately before exposure to the lethal dosage produce marked protective stupefaction [*cf.* *R.A.E.*, A **27** 343], but the stupefaction was lost at this temperature when one hour elapsed between the exposures. At 77°F., non-resistant mature females were not markedly stupefied when exposed to the same sublethal dosage immediately before the lethal dosage, but were stupefied to a significant extent when one hour elapsed between the sublethal and the lethal dosages.

In laboratory fumigations simulating conditions in the field, at temperatures of 58–65°F., resistant mature females were stupefied with a 45-minute exposure to a sublethal dosage applied immediately prior to the lethal dosage. The stupefying effect was partly lost in two hours, but not completely in three hours. Under the same conditions, scales in the second moult were stupefied with the same sub-lethal dosage immediately prior to the lethal dosage, and the stupefying effect was dissipated in two hours. The effect of exposure for three successive 45-minute periods to a sublethal dosage was the same as that of a single 45-minute exposure. On the first trees treated in field fumigation, when there was no stupefaction due to previous exposure to sub-lethal dosages, the scales in the second moult and early grey adult stages were more difficult to kill than mature females. However, on trees on which stupefaction occurred, as a result of gas leaking from the tents over the trees treated first, the reverse was found to be true.

Yust (H. R.) & Busbey (R. L.). **A Comparison of the Susceptibility of the so-called resistant and nonresistant Strains of California Red Scale to Methyl Bromide.**—*J. econ. Ent.* **35** no. 3 pp. 343–345, 4 refs. Menasha, Wis., 1942.

In laboratory tests in California with strains of *Aonidiella aurantii*, Mask., that were resistant and non-resistant to fumigation with hydrocyanic acid gas, it was found that resistant mature females were resistant to fumigation with methyl bromide and non-resistant mature females were not, but that the difference in susceptibility between the two strains was less than in the case of HCN [*cf.* *R.A.E.*, A **28** 573]. Early grey adults of the resistant strain were more susceptible to methyl bromide than those of the non-resistant strain when the period of exposure was 40 minutes, but not when it was 120–180 minutes, and there was no difference in the susceptibility of the two strains in the second moult to methyl bromide in the limited number of tests made.

Holloway (J. K.), Henderson (C. F.) & McBurnie (H. V.). **Influence of Tartar Emetic on the Yellow Scale and its Parasite,** *Comperiella bifasciata* **(How.).**—*J. econ. Ent.* **35** no. 3 pp. 346–347, 2 refs. Menasha, Wis., 1942.

The following is based on the authors' summary and conclusions. Three field experiments were carried out in California in 1940 and 1941 to determine the effect of sprays of tartar emetic and sugar, as applied to orange trees for the control of *Scirtothrips citri*, Moult. [*cf. R.A.E.*, A **29** 297; **31** 58], on populations of *Aonidiella citrina*, Coq., and its parasite, *Comperiella bifasciata*, How., as laboratory tests had shown such sprays to be toxic to adults of the parasite. The sprays did not influence the populations of the Coccid or cause any significant differences in parasitism by *C. bifasciata* between the treated and control plots, and it may therefore be concluded that the deposits are not attractive to the parasites as a source of food under field conditions.

HOLLOWAY (J. K.), HENDERSON (C. F.) & McBURNIE (H. V.). **Population Increase of Citrus Red Mite associated with the Use of Sprays containing inert granular Residues.**—*J. econ. Ent.* **35** no. 3 pp. 348–350. Menasha, Wis., 1942.

The following is based on the authors' summary. Sprays containing copper sulphate, zinc sulphate, manganese sulphate, hydrated lime and anhydrous sodium carbonate (soda ash) were applied to lemon and Valencia orange trees in 1940 and 1941 in California to determine the influence of the inert deposits on populations of *Paratetranychus citri*, McG. These increased after the application of a fungicidal spray containing zinc sulphate, copper sulphate and hydrated lime and after a deficiency spray containing zinc sulphate and soda ash. A mite of the genus *Seiulus* was the only natural enemy sufficiently numerous to be recorded. It was least abundant in the two treatments resulting in the greatest increase of *P. citri*, but its scarcity was not considered the dominant factor associated with the increase, since there was no correlation between the densities of the two mites in the unsprayed plots. The possibility of the fungicidal spray inhibiting control of *P. citri* by fungi is remote, as there was no evidence of the presence of fungus in the control plots. Three months after the populations of *P. citri* had reached a peak in one experiment, there was a general reduction, so that there was no difference between the resulting populations in the treated and untreated plots; the disproportionate reduction could not be attributed to predators, but there were indications that the leaves were rendered less suitable to the mite because of the increased amount of feeding injury associated with denser populations.

Within the range of the quantities of the materials used (6–19 lb. residue per 100 U.S. gals. water), the increase in mite population was associated with some physical or chemical property of the spray rather than with the quantity of inert material used. No chemical or physical influences of the sprays on longevity or egg production of the mite were observed in a laboratory experiment.

THOMPSON (W. L.). **The Effect of Magnesium Deficiency on Infestations of Purple Scale on Citrus.**—*J. econ. Ent.* **35** no. 3 pp. 351–354, 2 figs., 6 refs. Menasha, Wis., 1942.

Infestation of *Citrus* by the purple scale [*Lepidosaphes beckii*, Newm.], which was relatively light in Florida before 1936, as a result of magnesium deficiency in the soil, has increased since 1937, owing to the addition of magnesium compounds to the fertilisers used [*cf. R.A.E.*, A **30** 445]. Data from three experiments on the effect of adding magnesium in the form of dolomite or magnesium sulphate to nutrient sprays applied to grape-fruit trees indicated that populations of *L. beckii* were significantly lower on leaves that were bronzed owing to magnesium deficiency than on green leaves of the same age [*cf.* **28** 472]. Treatment with fungicidal and nutritional sprays containing copper, zinc and manganese sulphates neutralised with hydrated lime resulted in an increase of scale on trees that were deficient in magnesium and also, to some degree, in copper, zinc and manganese, but this was much greater when magnesium was supplied;

the increase was progressively less in trees treated with copper and zinc sulphates and with only one nutrient element, but there was the same difference between trees deficient and non-deficient in magnesium. The populations were correlated with the vigour of the trees rather than with the amount of spray residue [*cf.* **28** 471], and the vigour of the trees depended on the supply of magnesium under the conditions of this experiment.

Indirect factors that reduced scale development on trees deficient in magnesium included the greater thoroughness with which the sparsely foliated trees could be covered with insecticide and the premature dropping of infested leaves.

McGregor (E. A.). **Sulfur Dust as a Supplement to Cyanide Fumigation for Control of Black Scale and its Effect on Citrus Red Mite.**—*J. econ. Ent.* **35** no. 3 pp. 355–358, 2 refs. Menasha, Wis., 1942.

The results are given of experiments carried out in two orchards of Valencia orange in southern California in 1937–40 in which dusts containing 98 per cent. sulphur were applied against *Saissetia oleae*, Bern., in May and June to supplement fumigation with hydrocyanic acid gas in August. Since sulphur is most effective against scale insects just after they have hatched, a first application was made when hatching began, and a second 25–30 days later. Counts of living mature scales on twigs in the spring of treatment and the following spring and of living young scales on leaves in August, before fumigating, showed significant reductions in numbers on the dusted plots, whereas the populations were higher in the spring after fumigation only in most cases ; also, a plot that was dusted in two successive years showed significantly lower numbers than one that was dusted for one year only. Records obtained in 1937 and 1939 showed that the dusting caused very high mortalities of *Paratetranychus citri*, McG. In no case was sulphur damage to fruit or foliage detected.

Lewis (H. C.). **Lime Zinc Spray as a Repellent for Leafhoppers on Citrus.**—*J. econ. Ent.* **35** no. 3 pp. 362–364, 5 refs. Menasha, Wis., 1942.

Much of the information in this account of the injury caused to orange fruits in central California by overwintering adults of *Empoasca fabae*, Harr., and the application of a whitewash containing lime and zinc sulphate to repel them is similar to that already noticed [*R.A.E.*, A **28** 616]. The author states that migration into orange groves has increased in each season since 1938, necessitating more widespread spraying each year. Orchards along the west side of the Citrus Belt adjoining the valley areas used for growing field crops are injured earliest and most seriously, vigorous groves and large or closely set trees being preferred, presumably because of the better protection for hibernation. The adults are present in the groves from September–November until about the beginning of March. The injury has been confined to the fruit except in a few extreme cases when new foliage was damaged. There is no evidence that the spots caused by feeding are the result of toxic action ; they are thought to be due to the release of the orange oil that occurs in the skin of the fruit. A single application of a light whitewash in autumn or early winter has generally given satisfactory protection and has caused no damage to the trees when made every year for four years. The formula recommended for Valencia oranges is 33·3 lb. lime, 5 lb. zinc sulphate and 0·67 lb. casein spreader or 1 U.S. pint fish oil per 100 U.S. gals. spray, with, in some cases, the addition of 1 lb. copper sulphate to improve the control given by the zinc sulphate of a fungous disease that attacks Valencias during winter; on navel oranges, the amount of lime is reduced somewhat, since the period for which protection is required is shorter. The whitewash residue has not resulted in any increase of

Scirtothrips citri, Moult., *Coccus pseudomagnoliarum*, Kuw., or *Aonidiella citrina*, Coq., the only other insects of commercial importance on *Citrus* in this area.

BOHART (R. M.). **Life History of** *Diaspis boisduvalii* **and its Control on** *Cattleya* **with Calcium Cyanide.**—*J. econ. Ent.* **35** no. 3 pp. 365–368, 5 refs. Menasha, Wis., 1942.

An account is given of experiments on the control of *Diaspis boisduvali*, Sign., which is the most abundant of several species of insects reported as attacking orchids of the genus *Cattleya* grown under glass in California, and of observations on its life-history made in the laboratory on plotted plants at temperatures of 72–78°F. and high humidity. Single females produced approximately 200 eggs, which hatched in a maximum of 7 days, and the crawlers settled within 2 days, though if they were disturbed they sometimes moved to another spot. Details are given of the development of males and females and of a population study, in which seven females gave rise to approximately 10,000 individuals, half of which were females, in five months, the rate of increase of females in each successive generation being apparently about 9 : 1. The development of the males and that of the females from egg to egg averaged 33 and 50 days, respectively.

Although the orchids appear to tolerate high concentrations of hydrocyanic acid gas under certain conditions [*cf. R.A.E.*, A **13** 248], injury from its use has sometimes been reported, and dosages of 0·067, 0·1 and 0·125 oz. granular calcium cyanide (Cyanogas G-fumigant, stated to contain 40–50 per cent. calcium cyanide) per 1,000 cu. ft. for 12 hours were therefore tested at temperatures of 62–72°F. and humidities of 85–90 per cent. on heavily infested orchids, for which the alternative control methods of spraying with water-miscible pyrethrum extract or washing the scales off the leaves with paint-brushes dipped in solutions of pyrethrum or nicotine sulphate had proved ineffective. The amount of plant injury was very variable ; weak plants occasionally suffered severe scorching, and much more extensive injury resulted from fumigation with 0·125 oz. than with 0·1 oz. The degree and appearance of injury was different on plants of different parentage, the slow-growing types being generally most susceptible. The dosage of 0·1 oz. caused almost 100 per cent. mortality of females in the first and second instars and 81·7 per cent. of the mature females, and 0·125 oz. killed 84·4 per cent. of the latter, whereas 0·067 oz. killed only 37·3 per cent. in a single test. Fumigation of two greenhouses with 0·1 oz. per 1,000 cu. ft. in two successive weeks and with 0·1 oz. followed by 0·125 oz. in the next week, respectively, gave 97·6 and 96·9 per cent. mortality of mature females, and treatment of the second house with 0·1 oz. in the third week increased the percentage to 98·4. Seven weekly treatments practically eliminated the scales, and no further control was necessary until large numbers in the first and second instars appeared on the leaves four months later. Occasional series of fumigations at 0·1 oz. for three successive weeks then kept the population at a low level without undue injury to the plants.

CAMPBELL (R. E.) & ELMORE (J. C.). **Commercial Control of the Pepper Weevil in California.**—*J. econ. Ent.* **35** no. 3 pp. 369–373. Menasha, Wis., 1942.

Owing to mild weather, adults of *Anthonomus eugenii*, Cano, survived the winter of 1940–41 in large numbers on nightshade [*Solanum*] in southern California, and were so numerous in early spring that seed-beds as well as early-planted fields of peppers [*Capsicum*] became heavily infested. Since heavy rains delayed field planting for at least a month, so that even blossom buds became infested before the fruits began to set, destructive populations of the weevil developed and caused serious damage throughout the season. Calcium arsenate and cryolite are the only insecticides that give effective control of the weevil, and the former resulted in injurious infestation by *Myzus persicae*, Sulz., in 1940, so that cryolite was used almost exclusively in 1941. Natural cryolite containing 90 per cent. sodium fluoaluminate was mixed with an equal quantity of diluent, usually finely ground talc, and enough cubé powder was added to give 0·5 per cent. rotenone in the final mixture, as a precaution against an increase of Aphids; an average of 15–20 lb. dust per acre was applied with power or hand dusters, smaller quantities being used in the first two applications and 20–25 lb. in the later ones. It was recommended that the fields should be examined frequently early in the season and treated from the time when the first fruits began to set until most of them were mature if infestation was present in the vicinity, three applications being made at intervals of 4–5 days, followed after 10 days by three more at 5-day intervals. Comparison showed that the average numbers of fruits per plant in undusted fields and fields dusted at least three times were 3·6 and 13·8 on Mexican chili pepper, 4·6 and 19·9 on California chili pepper and 14·2 and 36·9 on paprika pepper. Fields dusted 6–9 times produced more fruits per plant than those dusted 2–5 times, and poor results were obtained with applications that were too light or made at the wrong time. Late-planted fields were more severely damaged than those that were planted earlier, but the effect of late planting was overcome by continuing the applications beyond the regular schedule. Improved washing equipment made it possible to remove poisonous residues by agitation in warm hydrochloric acid. The cost of treatment is discussed.

Four applications of a pyrethrum dust gave little or no control.

MUNGER (F.). **A Method for rearing Citrus Thrips in the Laboratory.**—*J. econ. Ent.* **35** no. 3 pp. 373–375, 3 figs., 2 refs. Menasha, Wis., 1942.

A suitable cage for rearing *Scirtothrips citri*, Moult., is made by cutting oval holes in two sheets of glass, and placing them one over the other, separating them if necessary by a larger oval ring of plaster. The hole in the lower sheet is placed over a *Citrus* leaf with the petiole removed, the lower surface of which is in contact with a moist pad, and the hole in the upper sheet is covered with bolting cloth to permit the escape of transpired moisture. Leaves that have been exposed to reproducing thrips to obtain eggs are placed under the sheets of glass without the plaster ring until 50–100 or more nymphs have hatched, when these are brushed into another cage, with the plaster ring in position, over a leaf dusted with sugar. They should be allowed to feed for several hours on the leaf on which they hatched before being transferred, as fewer casualties result with larger larvae and more insects can be reared without changing the leaf. When the thrips reach the adult stage, they are lightly chloroformed and brushed on to a fresh leaf, over which the cage is placed; a hundred adults require a fresh leaf daily. A constant temperature of 87·5°F., at which the duration of the immature stages is approximately five days, and a relative humidity of 50 per cent. are most favourable for rearing. Since 22 generations have been reared consecutively without loss of vigour, the thrips can apparently be bred indefinitely in the laboratory. Nymphs in the rearing cage usually pupate in the angles between the glass and the plastic ring, but if it is desired to separate the pupae, a trap, consisting of one cover glass superimposed on another and kept about 0·4 mm. apart at one end, is used for collecting the full-grown nymphs, which are strongly thigmotactic and collect where the pieces of glass are 0·2 mm. apart.

BREAKEY (E. P.). **Calcium Cyanamid, a possible practical Control for Pear Thrips, in Prune Orchards.**—*J. econ. Ent.* **35** no. 3 pp. 376–382, 4 figs., 7 refs. Menasha, Wis., 1942.

The results of further plot tests in Washington on the application of pulverised commercial calcium cyanamide containing 5 per cent. oil to the surface of the soil and vegetative cover under prune trees for the control of *Taeniothrips inconsequens*, Uzel, carried out in the spring of 1941, confirmed those obtained in earlier experiments [*R.A.E.*, A **29** 418, etc.]. Applications of 100, 150 and 200 lb. per acre, when the thrips were beginning to emerge, again proved as effective as 300 lb., reducing the numbers by approximately 90 per cent., and subsequent applications 10 days later, for maximum effectiveness against the brown rot fungus, *Sclerotinia fructicola*, apparently failed to increase the effectiveness of the treatment. Rain falling within a day or two of applications improved the control obtained. In tests on the possibility of combining calcium cyanamide with other fertilisers, the addition of superphosphate or hydrated lime materially reduced its toxicity. Blossom counts made in large-scale treatments, in which 300 acres were given two applications of 150 lb. cyanamide per acre by means of a power duster, confirmed the results obtained experimentally.

BAILEY (S. F.). **The Grape or Vine Thrips,** *Drepanothrips reuteri*.—*J. econ. Ent.* **35** no. 3 pp. 382–386, 4 figs., 23 refs. Menasha, Wis., 1942.

Details are given of the bionomics in California of *Drepanothrips reuteri*, Uzel, which causes scarring on the fruit and sometimes stunting of young canes and scorching and curling of leaves of grape-vine by its feeding in the nymphal and adult stages, and pupates in curled leaves under the vines or in the top soil. There are 5–6 overlapping generations in the year ; the egg, nymphal, prepupal and pupal stages last 6–10, 4–9, 1–1½ and 1½–5 days in midsummer, when the total life-cycle averages about 22 days. It is believed that the winter is passed in the soil, chiefly in the adult stage, and that only very small numbers survive. Lists are given of other species of thrips that have been found on cultivated and on wild grape vines in California and those injurious to vines elsewhere. The distribution and food-plants of *D. reuteri* are recorded and various stages are briefly described. This thrips has hitherto been controlled in California by contact insecticides applied against the grape leafhopper [*Erythroneura comes*, Say], but if a special treatment should become necessary, a spray of 2 lb. tartar emetic and 4 lb. sugar per 100 U.S. gals. water, applied in May or June against the nymphs and adults, will prevent further injury to young shoots and fruit clusters.

DEAN (F. P.), NEWCOMER (E. J.), CASSIL (C. C.) & ALEXANDER (C. C.). **Efficiency of Nicotine Sprays for Codling Moth Control in the Pacific Northwest.**—*J. econ. Ent.* **35** no. 3 pp. 387–392, 3 figs., 7 refs. Menasha, Wis., 1942.

An account is given of field tests carried out on a small scale in Washington in 1938–40, in which tank-mixed sprays of nicotine sulphate with bentonite and soy-bean oil or with mineral oil were compared with others containing 3 lb. lead arsenate per 100 U.S. gals., applied at the same times, for the control of the codling moth [*Cydia pomonella*, L.] on apple trees that had received a lead-arsenate calyx spray. The main treatment comprised four cover sprays of 1 U.S. pint nicotine sulphate, 5 lb. bentonite and 1 U.S. quart soy-bean oil in 100 U.S. gals. water, with the addition of ½ oz. sodium lauryl sulphate in some cases, against the first generation, and two or three of a similar spray in which the quantities of nicotine sulphate and bentonite were reduced to 0·67 U.S. pint and 3 lb., followed by final sprays of 0·67 pint nicotine sulphate in 100 gals. 0·75 per cent. mineral-oil emulsion against the second. The results obtained with the nicotine bentonite were variable and not affected when oil emulsion was substituted for soy-bean oil and bentonite in four applications, though control was impaired by such substitution in all applications. Chemical analyses carried out during 1940 showed that the use of sodium lauryl sulphate did not affect the amount of deposit, that nicotine bentonite deposited considerably more nicotine than a nicotine-oil spray and that nicotine deposits dropped abruptly when a reduced concentration of nicotine with oil was applied towards the end of the season. Periodic observations on infestation showed that frequent applications of the tank-mixed nicotine bentonite gave control equal to that by lead arsenate, but the reduction in the quantity of nicotine and substitution of mineral oil for bentonite and soy-bean oil and the longer interval between sprays late in the season resulted in insufficient protection of the fruit.

These tests do not show nicotine bentonite to be a satisfactory substitute for lead arsenate for the control of *C. pomonella* in the Pacific north-west, and until large-scale tests have been made, it can be recommended only for lightly infested areas, particularly in pear orchards.

MICHELBACHER (A. E.) & SMITH (R. F.). **Experiments for controlling the Western Peach Borer.**—*J. econ. Ent.* **35** no. 3 pp. 393–398, 12 refs. Menasha, Wis., 1942.

The authors describe experiments carried out on apricot trees in California in 1940–41 to compare the control of larvae of *Aegeria* (*Sanninoidea*) *opalescens*, Edw., given by 25 per cent. emulsions (by weight) of ethylene dichloride or dichloroethyl ether in water, poured on the base of the trunk and the soil surrounding the trees at the rate of 0·5 and 0·75 U.S. pint per tree with that by 2 oz. paradichlorobenzene crystals applied in a circle round the base of the tree. The trees were mounded after treatment. An application of ethylene dichloride on 9th February or 2nd May 1940 resulted in approximately 80–90 per cent. control of the borers with no significant differences between treatments. In one orchard, ethylene dichloride at the higher dosage and paradichlorobenzene gave 60·5 and 97·3 per cent. control when applied in September 1940, but the former gave less than 20 per cent. control in November, possibly because the vapour escaped too rapidly through the very dry soil. In another, however, there was no significant difference between ethylene dichloride, paradichlorobenzene and dichloroethyl ether applied in September and ethylene dichloride applied in November 1940 and in January and March 1941, all of which gave practically 70–100 per cent. control. Treatment with the higher dosage of dichloroethyl ether, however, resulted in early leaf-fall in autumn and foliage of lighter colour in the following spring. Trees to which 1 U.S. pint of 25 or 44 per cent. ethylene dichloride emulsion was applied were uninjured.

It is concluded that ethylene dichloride is less effective against *A. opalescens* than against the eastern peach borer, *A.* (*S.*) *exitiosa*, Say [*cf. R.A.E.*, A **28** 356], but that it could be used when paradichlorobenzene would be ineffective owing to low temperatures and that control in late summer and autumn would probably be increased if the treatment followed irrigation. Since it is not much more effective than paradichlorobenzene in autumn, the latter is still recommended unless treatment cannot be carried out in warm weather. Dichloroethyl ether is dangerous to the trees and ethylene dichloride should be applied with caution [*cf. loc. cit.*].

BOHART (R. M.). *Platynota stultana* **as a Pest of Field-grown Carnations.**—*J. econ. Ent.* **35** no. 3 pp. 399–403, 8 refs. Menasha, Wis., 1942.

Platynota stultana, Wlsm., has a wide range of food-plants but appears to be a persistent pest only on orange, rose and carnation in California. It has caused most serious damage to carnation during the last ten years, sometimes reducing the numbers of marketable flowers by more than 75 per cent. Small larvae tie the tips of young shoots ; the larvae may enter buds at various stages and entirely destroy them or deform the developing flowers ; and a small proportion of well grown larvae bore into the main stem and tunnel for several inches, often causing the plant to wilt or break. A female lays about 200 eggs in four masses on leaves or smooth surfaces ; the life-cycle lasted 43, 44 and 46 days on orange, rose and carnation, respectively, at an average temperature of 75°F. In the Los Angeles area, this Tortricid persists throughout the year on carnations grown in the field in cloth houses. There were apparently five overlapping generations in the year beginning August 1940, with peak flights about 8th September, 28th October, 27th April, 12th June and 27th July. Injury was most severe in May and June and least between January and April, when most of the larvae were in a mature dormant condition in dead leaves round the bases of the plants. The larvae were parasitised by *Microbracon platynotae*, Cushm., *Microgaster phthorimaeae*, Mues., and two undetermined Chalcids, and the pupae by two Ichneumonids, one of which was identified as *Exochus* sp., but only 0·5–2 per cent. of both stages were parasitised, except at the end of July 1941, when 20 per cent. of the larvae in cloth houses that had been in position for one year were attacked by *Microbracon*, 65 per cent. by one of the Chalcids and 5 per cent. by the remaining parasites. In spite of this, *Platynota* increased to injurious numbers on young plants in a cloth-house 100 yards away by mid-September.

In tests of various sprays in 1940 and 1941, natural cryolite killed 74·8, 75·2, 77·5, 87·5 and 90·7 per cent. of the larvae when applied once, twice with an interval of 7 days, three times at 7-day intervals in two plots, and six times at 3-day intervals at the rate of 6 lb. per 100 U.S. gals., and 72·9 and 78·8 per cent. when applied three times at 7-day intervals in two plots at the rate of 8 lb.; 4 oz. blood albumin per 100 U.S. gals. was added to each spray. Cuprous cyanide at 6 lb. per 100 U.S. gals. with 4 oz. blood albumin gave 81 per cent. kill after 3 applications, but is too expensive. None of the other substances gave as much as 70 per cent. control. Lead arsenate and nicotine bentonite left an objectionable residue on the plants, mixtures of pyrethrum and rotenone destroyed the natural bloom of the foliage, and Paris green scorched the petals and sepals severely. A cryolite dust was less effective than the spray when used at an equivalent rate.

DOUCETTE (C. F.). **Variations in Tolerance of Narcissus Bulbs to Hot Water-Formalin Treatment associated with Locality of Production or of Storage.**—*J. econ. Ent.* **35** no. 3 pp. 403–405, 1 fig. Menasha, Wis., 1942.

The following is substantially the author's summary of experiments to determine the effect of differences in climatic conditions in the growing or storage season on the tolerance of narcissus bulbs to treatment with hot water and formalin. Bulbs from several localities in Washington and Oregon were soaked in water at 75–80°F. for 2 hours and then immersed for 4½ hours in water at 111° containing formalin (40 per cent. formaldehyde) at a dilution of 1 : 400. The similarity of response of all the bulbs treated 6–8 days after digging indicated that no important variation was associated with growing conditions in the different localities. The bulbs stored at the several localities until treatment near the end of the storage season varied considerably in their response, decreasing in tolerance as the localities ranged from south to north.

DOHANIAN (S. M.). **Variability of Diapause in** ***Melissopus latiferreanus.***—*J. econ. Ent.* **35** no. 3 pp. 406–408, 5 refs. Menasha, Wis., 1942.

Cydia (*Melissopus*) *latiferreana*, Wlsm., which is indigenous to the United States and Mexico, has been separated into seven varieties, designated by letters, of which D, E, F and G have been found between the Rocky Mountains and the Atlantic coast and A, B and C west of the mountains. Only two varieties were reared from material collected in Washington, Oregon and California during the past four years, A from nuts of wild hazel [*Corylus*] and the galls of two Cynipids on the leaves and the stems and twigs of oak, and C from Catalina cherries [*Prunus lyonii*], from which the species was originally described, cultivated filberts [*C. avellana*], of which it is a serious pest [*R.A.E.*, A **29** 405], and acorns. All the 55 adults that emerged from collections of Catalina cherries made on Catalina Island (California) on 9th and 20th August and 1st and 6th September 1938 were of the latter variety ; 8 of them (all from the August collections) emerged in time to produce another generation during the same season, 37 emerged in 1939, 7 in 1940 and 3 in 1941 ; thus, 13 per cent. of the larvae hibernated in the soil of the cage through two winters, and 5 per cent. through three. A few individuals of this variety that had hibernated through two winters were reared from acorns and filberts collected in north-western Oregon.

Manis (H. C.) & Turner (E. L.). **Biology and Control of** ***Empoasca filamenta*****.**—*J. econ. Ent.* **35** no. 3 pp. 416–418, 2 refs. Menasha, Wis., 1942.

Empoasca filamenta, DeLong, which is abundant on potato in Idaho, but causes only slight spotting of the leaves, has been found to feed on 14 wild plants as well as on various garden and field crops. Lists of the plants are given. This Jassid overwinters in the adult stage in débris near cultivated fields, and the first spring generation, which migrates to potato, is produced on wild food-plants. The duration of the egg and nymphal stages averaged 12 and 16 days, respectively, and there are three complete generations and a partial fourth in the season. The leafhopper was effectively controlled by a dust of pyrethrum, cubé and talc and a spray of pyrethrum extract and lime-sulphur, but was not affected by Bordeaux mixture or dusts containing sulphur, which control *E. fabae*, Harr., or by a dust of cubé and talc or a lime-sulphur spray. No increase in yield accompanied its control.

Woodworth (C. E.). **Will Click Beetles mate more than once and are they parthenogenetic ?**—*J. econ. Ent.* **35** no. 3 pp. 418–419, 1 ref. Menasha, Wis., 1942.

In experiments in which unmated females of *Pheletes* (*Limonius*) *canus*, Lec., were caged successively with individual males, 41 per cent. of the males fertilised three females, as determined by the hatching of the eggs that were laid, and 4 per cent. fertilised as many as five ; fertilisation occurred at irregular intervals, but most freely with the first females. Of females that had been separated from males since the previous autumn, 77 per cent. deposited eggs, but none of these hatched, whereas similar females that were caged with males in March all laid eggs that hatched in the normal time.

Since these results show that the males can successfully mate several times, the use of traps, which attract large numbers of males but relatively few females [*cf. R.A.E.*, A **20** 682], has no practical value, although the females cannot reproduce parthenogenetically.

Rockwood (L. P.) & Reeher (M. M.). **Time of Seeding as a Method of Control for the Pea Aphid on Fall-sown Legumes in the Pacific Northwest.**—*J. econ. Ent.* **35** no. 3 pp. 420–423, 4 refs. Menasha, Wis., 1942.

Macrosiphum onobrychis, Boy. (*pisi*, Kalt.) caused widespread injury in Oregon and Washington to seed crops of common vetch (*Vicia sativa*), hairy vetch [*V. hirsuta*] and Austrian winter field peas, which are sown in autumn, each year from 1938 to 1941 and in five other seasons during the last 25 years. Winged Aphids migrate to plants that are above ground before late October almost as soon as these appear, and viviparous females become established in autumn, particularly on the earliest plants, with the result that the plants are severely damaged in the following spring if the winter is mild. Observations made over four years showed that some spring injury invariably followed even light autumn infestations, whereas fields that were uninfested in autumn often escaped appreciable injury ; also, winged Aphids developed in autumn and early in spring on early-sown and self-sown annual leguminous plants that appeared in September and migrated from these to neighbouring fields.

Laboratory tests having indicated that flight of *M. onobrychis* does not occur in autumn on days when the maximum temperature is below 60°F., the last possible date of flight in the years 1916–40 was obtained from meteorological records, and the average length of time that elapses between sowing and the appearance of the plants was determined by observation. From these data it was calculated that to avoid infestation by Aphids, common vetch and Austrian winter field peas for seed should be sown in well-prepared ground that is free from self-sown annuals, about 20th October and not before 16th October, and hairy vetch not before 11th October. The approximate correctness of these dates was substantiated by data obtained from a series of plots sown on successive dates throughout the autumn for the last ten years. If late sowing is to secure its maximum effect in reducing Aphid abundance, cover crops and green manure crops should be ploughed under by 7th April, the approximate date for the first spring flight of *M. onobrychis*.

SHIRCK (F. H.). **The Flight of Sugar-beet Wireworm Adults in southwestern Idaho.**—*J. econ. Ent.* **35** no. 3 pp. 423–427, 1 graph, 3 refs. Menasha, Wis., 1942.

The following is substantially the author's summary. Collections of adults of the sugar-beet wireworm, *Pheletes* (*Limonius*) *californicus*, Mannh., were made in 1938–41 by the use of standard insect nets [*cf. R.A.E.*, A **28** 364]. The flight period in south-western Idaho extends from the middle of April to the end of May. About 89·1 per cent. of all the beetles taken in flight during 1938–41 were females, and about 87·2 per cent. of those swept from vegetation in 1940 were males. Field counts made before spring emergence showed that the sexes occur in about equal numbers. The females taken on the wing subsequently deposited an average of 74·9 eggs each ; the great majority of females mated before flying, but some apparently flew before depositing any of their eggs. Flights occurred on warm, calm days, principally between 2 and 4 p.m.

HARTZELL (A.) & SCUDDER (H. I.). **Histological Effects of Pyrethrum and an Activator on the central Nervous System of the Housefly.**—*J. econ. Ent.* **35** no. 3 pp. 428–433, 16 figs., 9 refs. Menasha, Wis., 1942.

The following is substantially the authors' summary and conclusions. Pyrethrum and its activator, isobutyl undecylene amide, were each found to show characteristic effects on the central nervous system and associated tissues of adults of *Musca domestica*, L. Pyrethrum has a widespread clumping effect on the chromatin of the nuclei, whereas the activator seems to cause a chromatolysis or dissolution of the chromatin. A combination of these two agents (as in Pyrin) shows a histological picture that is a summation of the effects of both. The interaction of these two types of nuclear destruction may be the true basis of " activation." It seems likely that a study of the progression of these effects can be made, perhaps even to include the nature of revival after knockdown.

LINSLEY (E. G.). **Insect Food Caches as Reservoirs and original Sources of some Stored Products Pests.**—*J. econ. Ent.* **35** no. 3 pp. 434–439, 59 refs. Menasha, Wis., 1942.

Records, based on observations in California and the world literature, are given of Coleoptera, Lepidoptera and a Psocid found in the nests of bees and wasps. Most of the pests of stored products appear to be seed-infesting species, such as weevils and Bruchids, scavengers feeding generally on dead plant or animal products, including moths, Dermestids, Ptinids and Anobiids, scavengers or semi-predators living primarily under bark, which are chiefly beetles, particularly Tenebrionids, Cucujids and Trogositids, or scavengers or depredators inhabiting the nests of bees, wasps and other Aculeate Hymenoptera. A few species of *Ptinus* and *Antherophagus* and the moths, *Achroia grisella*, F., and *Aphomia sociella*, L., live primarily in the nests of bees, and though the nests are probably only one of many favourable habitats for the other beetles and moths found in them, they possibly serve as reservoirs for some species, maintaining small populations that may later serve as foci for the infestation of foods stored by man. Gregarious bees, their associates, and social bees and wasps provide more favourable conditions for the insects that attack stored food than the more solitary species, as they use their nesting sites for longer periods and develop larger and more concentrated populations and stores of food.

DAHMS (R. G.) & FENTON (F. A.). **Experiments with poisoned Bait to control Armyworms in Wheat.**—*J. econ. Ent.* **35** no. 3 pp. 439–440, 1 ref. Menasha, Wis., 1942.

An account is given of experiments with baits against *Cirphis unipuncta*, Haw., in plots of wheat, carried out during a severe outbreak in Oklahoma in the spring of 1941 to determine the optimum concentration of poison in the bait and quantity of bait per acre. A bait of 2 U.S. quarts sodium arsenite (32 per cent. arsenious oxide) per 100 lb. wheat bran, moistened with water and applied when most of the larvae were in the last instar, gave approximately equal control at 20, 30 and 40 lb. per acre, dry weight, but was not effective at 10 lb. per acre. Comparison of baits containing 1·5 and 2 U.S. quarts sodium arsenite per 100 lb. bran, applied at 20, 30 and 40 lb. per acre, showed considerably better kill for the higher concentration after 40 hours, but practically equal mortality after 65 hours. None of the treatments caused significant reductions in the amount of damage by the larvae, which injured the kernels when present at the rate of 42 or more per sq. yard, and it is concluded that the bait should be applied when they are in the early instars in order to protect the wheat adequately.

RITCHER (P. O.) & JEWETT (H. H.). **White Grub Control with Dichloroethyl Ether.**—*J. econ. Ent.* **35** no. 3 pp. 441–445, 9 refs. Menasha, Wis., 1942.

The results of experiments carried out in Kentucky in 1937–41 on the control of larvae of *Cotinis nitida*, L., and *Lachnosterna* (*Phyllophaga*) *hirticula*, Knoch, in plots of Kentucky bluegrass [*Poa pratensis*] with dichloroethyl ether applied to the soil in May and August, respectively, showed that a solution containing 32 cc. per U.S. gal. water gave poor control of third-instar larvae of both species when applied at the rate of 1 U.S. gal. per sq. yard, but 67·8–93·2 and 65·4–99·3 per cent. control, respectively, when applied at 2–2¼ U.S. gals. per sq. yard, at which dosage it had little or no effect on the bluegrass, though it caused severe injury to *Sida spinosa*, dandelion and small tobacco plants. The addition of about 0·05 or 0·1 per cent. Tergitol 7 penetrant (a sulphated alcohol) caused no significant increase in the control of either species, but facilitated the preparation of the solution. In general, there was no significant difference between the control given by the dichloroethyl-ether solution and a solution of sodium cyanide (10·5 oz. in 50 U.S. gals. water) when both were applied at rates of 2 or 2¼ U.S. gals. per sq. yard.

BALDUF (W. V.). **Evaluating the economic Status of** *Phymata*.—*J. econ. Ent.* **35** no. 3 pp. 445–448, 5 refs. Menasha, Wis., 1942.

The author describes a method of estimating the economic status of the predacious bug, *Phymata pennsylvanica americana*, Melin, on the basis of records obtained in the field in Illinois in 1938–40, by assigning numerical values to the beneficial and destructive importance of each prey species, multiplying these values by the number of individuals of the species recorded as having been taken and subtracting the sum of the destructive values from that of the beneficial ones. From these calculations, he concludes that this Phymatid is slightly more destructive than beneficial, but he shows that the efficiency of the method is limited, since the quantity and quality of the food provided by the prey varies with the species, sex and stage, and, for both predator and prey, the economic status is dependent, to a considerable extent, on the environment and the voracity, longevity and reproductive capacity, which are not constant within the species.

HORSFALL (W. R.). **Control of the Striped Blister Beetle through its gregarious Habits.**—*J. econ. Ent.* **35** no. 3 p. 449. Menasha, Wis., 1942.

In Arkansas, large swarms of *Epicauta lemniscata*, F., which feed on lucerne, but are of little importance to this crop, migrate when the hay is cut and cause severe damage if they attack garden crops. As scattered outbreaks of this kind occur every year, experiments were carried out in 1941 on their control with a commercial derris dust diluted with talc, which may be used economically owing to their habit of feeding in compact swarms. When the beetles were dusted in cages, a mixture containing 1 per cent. rotenone killed only 58 per cent., but one containing 2 per cent. gave 79–97 per cent. mortality, and in tests carried out in lucerne fields in July, about 1 lb. of a mixture containing 2 per cent. rotenone gave almost complete control of a swarm covering an area of about 20 by 25 ft. and approximately 80 per cent. control of another occupying about 50 by 8 ft., when applied with a rotary duster in concentric rings from outside the swarm to the centre.

HASEMAN (L.). **Killing Codling Moth Larvae with low Temperatures.**—*J. econ. Ent.* **35** no. 3 pp. 449–450. Menasha, Wis., 1942.

The results are given of preliminary experiments designed to determine the low temperature lethal to larvae of the codling moth [*Cydia pomonella*, L.] when the frequency and rapidity of temperature changes, air and cocoon moisture, previous cold-hardening and protection afforded by the cocoon, tree trunk, packing shed and and snow coverage are taken into consideration. Full-fed larvae collected in orchards in the south-west and south-east of Missouri were induced to enter strips of corrugated paper and subjected to temperatures that fluctuated within the range between −30 and 50°F. Repeated alternate chilling and thawing of larvae that had already spun up for the winter did not seem to affect them seriously, provided that the temperature changes were not too rapid, the minimum temperature was not lower than 22°F., they were not kept at the low temperature for more than 24 hours at a time, and they did not weaken themselves by activity between chillings. Larvae that were removed from their cocoons and kept in vials were very active, and some were killed by the alternate chilling and thawing. A small proportion of the larvae, in which females slightly predominated, showed definite resistance to cold, though it did not appear that they developed added resistance as a result of repeated subjection to low temperatures. In the less severe tests, rather more females than males survived, but, in the more severe ones, larger larvae survived, and size rather than sex may be the deciding factor, since females tend to be larger than males. Mortality was increased by more rapid chilling and by moistening the corrugated paper and cocoons before subjecting them to low temperatures. The data obtained indicate that the zone of fatal low temperature for hibernating larvae is from 10 to −15°F., and that within this range mortality depends on length of exposure, the fatal exposure period rapidly decreasing between 0 and −15°F. The minimum fatal temperature was not definitely determined, but it is probably close to −15°F.

Yothers (M. A.), Carlson (F. W.) & Cassil (C. C.). **Sprays to kill overwintering Codling Moth Larvae.**—*J. econ. Ent.* **35** no. 3 pp. 450–451, 1 fig. Menasha, Wis., 1942.

In the spring of 1941, field tests were carried out in Washington with drenching sprays of dichloroethyl ether, nicotine sulphate (40 per cent. nicotine), pyrethrum extract (2·5 per cent. pyrethrins) and 4–6 dinitro-ortho-cresol emulsified in stove oil and water and applied to the trunks and branches of apple trees to a height of 7–8 ft. for the control of hibernating larvae of the codling moth [*Cydia pomonella*, L.]. The emulsifiers used were ethanolamine oleate at rates of 5 per cent. in the first two sprays and 3 per cent. in the third, and sodium lauryl sulphate at 0·5 per cent. in the fourth. A wetting agent, consisting of a mixture of equal quantities of ethylene glycol monobutyl ether and trichloroethylene was added at rates of 4, 4, 1 and 3 per cent., respectively. The percentage mortalities were 96·9 and 98·1 for sprays containing 5 per cent. dichloroethyl ether and 30 and 20 per cent. stove oil, respectively, 98·6 and 96·2 for 3 per cent. dichloroethyl ether and 30 and 20 per cent. oil, 97·4 for 1 per cent. nicotine sulphate (with 0·62 per cent. sodium carbonate to release the nicotine alkaloid) and 20 per cent. oil, 91 for 1 or 2 per cent. pyrethrum extract and 20 per cent. oil, 92·8 for 2 per cent. pyrethrum and 15 per cent. oil, 95·3 and 93·9 for 1 and 0·5 per cent. dinitro-o-cresol and 10 per cent. oil, and 2 for no treatment. The oil was ineffective without the addition of a toxic agent. No injury developed on unopened buds of one variety and only slight injury from the dinitro-o-cresol and the dichloroethyl ether on partly opened buds of another.

Later laboratory tests indicated that the wetting agent was of no value with the dinitro-cresol and that the concentration of all sprays could be reduced by the use of more effective wetters and emulsifiers.

Linsley (E. G.). **A natural Habitat for the Black Carpet Beetle.**—*J. econ. Ent.* **35** no. 3 p. 452, 2 refs. Menasha, Wis., 1942.

The author records the finding of *Attagenus piceus*, Ol., on several occasions in the last 4–5 years breeding in chipmunks' nests in mountain cabins in California, and suggests that these nests may have served as sources of infestations in the cabins that damaged woollens and other fabrics of animal origin brought from uninfested city buildings. T. H. G. Aitken also observed this species and *Anthrenus scrophulariae*, L., under similar conditions in the spring of 1941.

Linsley (E. G.). **Attack of the Lead Cable Borer on Asphalt Roofing Material.**—*J. econ. Ent.* **35** no. 3 p. 452, 1 ref. Menasha, Wis., 1942.

Leaks in the roof of a large building in San José, California, were found to be caused by large numbers of adults of the Bostrychid, *Scobicia declivis*, Lec., which bored into the asphalt roofing material at right angles to the surface until they reached the concrete slabs of the roof itself. The boring dust was apparently not ingested.

Linsley (E. G.). **Wood-boring Habit of the Drugstore Beetle.**—*J. econ. Ent.* **35** no. 3 p. 452, 1 fig., 4 refs. Menasha, Wis., 1942.

About 80 per cent. of the bamboo pieces of a mah-jongg set manufactured in China and purchased in San Francisco in 1924 were found to be severely damaged by Anobiids in 1941, after they had been untouched for some 15 years.

The larvae had bored into the bamboo where it was in contact with the back surface of the ivory face, being apparently attracted by the glue between. They were reared to adults, which were identified as *Sitodrepa* (*Stegobium*) *panicea*, L.

Busbey (R. L.), Yust (H. R.) & Fulton (R. A.). **Toxicity of Trichloroacetonitrile to the California Red Scale.**—*J. econ. Ent.* **35** no. 3 pp. 452–453, 1 ref. Menasha, Wis., 1942.

The results are given of laboratory fumigation tests with trichloroacetonitrile on females of a strain of *Aonidiella aurantii*, Mask., that was resistant to hydrocyanic acid gas. The percentage mortality of females 36 days old that had been reared at a temperature of 77°F. and were fumigated on lemon fruits for 40 minutes with 12 mg. per litre of trichloroacetonitrile was about 90 at 59, 97 at 68 and 99·2 at 77°F., and those of laboratory-reared females 37 and 38 days old that were fumigated for 40 minutes at 77°F. was 46·3 for 7 mg. per litre, 78·3 for 9 mg., 84·8 for 10·5 mg., and 92·5 for 12 mg. In tests with resistant females from the field, the percentage mortalities of mature Coccids were 22·8 for 6 mg. per litre at 79°F., 96·5 for 12 mg. at 82°F., and 99·8 for 20 mg. at 91°F. ; some Coccids in the second moult, which are relatively difficult to kill with HCN, appeared to be more susceptible than the mature ones. When trichloroacetonitrile was incorporated with HCN to determine its properties in overcoming protective stupefaction due to sublethal dosages of the cyanide, the results were not promising. The compound appears to be somewhat less toxic than HCN, but much more toxic than methyl bromide, and it caused no damage to lemons in one series of tests, but was injurious at all concentrations in another series in which the fruits were more turgid.

Riherd (P. T.). **An unusual Injury to Peas by Thrips.**—*J. econ. Ent.* **35** no. 3 p. 453, 1 fig., 1 ref. Menasha, Wis., 1942.

Blemishes on the pods of English peas grown in Texas were found to be caused by oviposition in the tissues by *Frankliniella helianthi*, Moult., a thrips that is fairly widely distributed in the west of the United States and seems to be a rather general feeder. In January 1942, approximately 75 per cent. of the pods in one locality were affected, and similar injury in the same district had been reported in March 1934.

McGregor (W. S.). *Orius insidiosus*, **a Predator on Cotton Insects in western Texas.**—*J. econ. Ent.* **35** no. 3 pp. 454–455. Menasha, Wis., 1942.

In western Texas, *Orius insidiosus*, Say, sometimes develops such large populations that it gives effective control of injurious insects, particularly those that attack cotton. During early June 1938, large numbers of nymphs of this Anthocorid reduced infestation by nymphs of *Psallus seriatus*, Reut., in a cotton field from an average of 86 per 100 plants to 9 per 100 in three days, and in late July, both nymphs and adults were observed preying on a heavy infestation of Aphids, and on recently hatched larvae of *Heliothis armigera*, Hb., that were feeding on the seed heads, in an adjacent field of grain sorghum. When the sorghum was cut for silage, shortly after, a severe outbreak of *Alabama argillacea*, Hb., in the cotton field was attacked by *Orius* nymphs, which destroyed over 90 per cent. of the pupae and over 70 per cent. of the grown larvae ; as a result, infestation by the second generation of the moth was insignificant, though no control measures had been applied. In September 1941, on cotton that was severely damaged by the first generation of *A. argillacea*, an average of 16 per cent. of the pupae were dead, and a number of prepupae were being attacked by *Orius*, which rendered control measures against the second generation unnecessary, although the weather was favourable for reinfestation.

MUNGER (F.). **Notes on the Biology of the Citrus Thrips.**—*J. econ. Ent.* **35** no. 3 p. 455. Menasha, Wis., 1942.

The author gives records of the durations of the immature stages of *Scirtothrips citri*, Moult., at 87·5°F. and 50 per cent. relative humidity and 77° and 60 per cent., at which total development lasted about 10 and 16 days, respectively, obtained in the course of rearing the thrips on lemon leaves for toxicological studies [*cf. R.A.E.*, A **31** 104] ; nymphal mortality was about 5–11 per cent. when sugar was provided. Of 302 adults, 43 per cent. were males. A total of 235 nymphs hatched from the eggs laid by 50 females in 24 hours, and 2,184 from those laid by 70 females (with 60 males) throughout their life. Parthenogenetic reproduction occurred, 188 adults, all of which were males, being reared from the eggs of nine unfertilised females. Adult females lived for 14–33 days at 87·5°F. ; the males generally lived for a shorter time.

LIST (G. M.) & KREUTZER (W. A.). **Transmission of the causal Agent of the Ring-rot Disease of Potatoes by Insects.**—*J. econ. Ent.* **35** no. 3 pp. 455–456, 3 refs. Menasha, Wis., 1942.

Phytomonas sepedonica, which causes the bacterial ring-rot disease of potatoes, is believed to be carried in the field by insects, and evidence supporting this view was obtained in laboratory tests carried out in Colorado in 1941, in which the disease organism was transmitted from infected foliage to healthy plants by adults of *Leptinotarsa decemlineata*, Say, adults of *Epicauta pennsylvanica*, DeG., and nymphs and adults of grasshoppers, mostly *Melanoplus differentialis*, Thos., and from a cut tuber showing ring-rot symptoms to a healthy plant by the grasshoppers.

GUNTHER (F. A.). **Analytical Isolation of Rotenone from a Spray Solution.**—*J. econ. Ent.* **35** no. 3 p. 458, 1 ref. Menasha, Wis., 1942.

As it was desired to determine the effect of a solubiliser on the stability of rotenone, and particularly of Cardolite 627 on the rate of decomposition (inactivation) of rotenone when both were in a kerosene solution, in connection with the current development of such sprays for the control of *Aonidiella aurantii*, Mask., a method was evolved for isolating rotenone from the spray solution by chromatographic adsorption, followed by colorimetric or polarimetric determination of the quantity of rotenone recovered. Two procedures by which the adsorption was carried out are described.

SCOTT jr. (D. B.). **Control of *Brachyrhinus sulcatus* Fab. in southern California.**—*J. econ. Ent.* **35** no. 3 p. 459, 1 fig., 1 ref. Menasha, Wis., 1942.

The author points out that control of *Otiorrhynchus* (*Brachyrrhinus*) *sulcatus*, F., on azaleas and camellias in nurseries in southern California is impracticable in autumn and early winter, when the larvae are girdling the upper roots and lower parts of the main stem, but effective during the preoviposition period of the parthenogenetic adults, which emerge in May and June and feed for 4–10 weeks before ovipositing [*cf. R.A.E.*, A **30** 264]. A spray of 4 lb. natural cryolite (Kryocide) and 1 U.S. gal. miscible medium petroleum oil per 100 U.S. gals. water, for combined control of the weevil and Coccids, was applied four weeks after the first adult weevils were noted in lath houses and again six weeks later against weevils that emerged late. No living weevils were found 36 hours after the first application, and caterpillars and *Pantomorus godmani*, Crotch, which was abundant, were effectively controlled by the second. Examination of many thousands of plants when they were being repotted during the following autumn and winter resulted in the discovery of only eight living larvae of *O. sulcatus*, as compared with infestations as high as 15–20 per cent. a year earlier. Since the weevils are wingless and migrate little on foot, inspection of all food-plants that are brought into the nurseries, including cyclamen and gardenia in addition to those already mentioned [*loc. cit.*], should prevent reinfestation.

BAILEY (S. F.). **The Prickly Pear Cactus Thrips,** *Rhopalothrips bicolor.—J. econ. Ent.* **35** no. 3 pp. 460–461, 3 figs. Menasha, Wis., 1942.

In 1938, fruits of an edible prickly pear (*Opuntia*), introduced from Sicily to the San José area of California about 50 years ago and now grown for a limited market, were scarred and cracked as a result of feeding by a thrips identified as *Rhopalothrips bicolor*, Hood, and in 1939 and 1940, more than half the crop was lost from this cause. *R. bicolor* was originally described in 1912 from material collected on *Opuntia* in Mexico in 1908. It had not been seen since, but was collected on *Opuntia* in Texas in 1939. Descriptions of the adults of both sexes are given. In California, the thrips, chiefly adults, migrate to the tender growth in spring, and when abundant, suck the sap from the potential blossom buds, which drop off or produce stunted misshapen fruits. Both adults and nymphs continue to feed on the more tender pads and developing fruits during summer; they are rarely seen on full-grown fruits, but the skin splits at the scars caused by earlier feeding, and vinegar flies [*Drosophila*] and dried fruit beetles [*Carpophilus hemipterus*, L.] immediately infest the cracked fruits. The thrips population reaches a peak in September. The life-cycle lasts about four weeks, and the adults live for about three and oviposit irregularly throughout this period. Reproduction is parthenogenetic, since no males were found in California, though they have been collected in Texas. The eggs are laid in the dense hair that surrounds the base of the spines on the new growth, and the unprotected pupae are found in cracks and depressions on the rough bases of the plants and under clods below the branches. Reproduction practically ceases during the winter, when a few individuals are found in the hair and behind the small leaves on the youngest pads; both alate and brachypterous forms are usually present, and migration occurs readily.

Control experiments showed that 1 per cent. emulsions of highly refined petroleum oil scorched the new pads, but a spray containing 2 lb. of a 5 per cent. rotenone powder per 100 U.S. gals. water with a spreader gave good control for 3–7 days; two applications about 10 days apart are required to reduce the seasonal infestation to a minimum. Dusts are not effective.

Service and Regulatory Announcements, April–June 1942.—*S.R.A., B.E.P.Q.* no. 151 pp. 29–47. Washington, D.C., U.S. Dep. Agric., 1942.

An announcement relating to Quarantine no. 48 against the Japanese beetle [*Popillia japonica*, Newm.] includes Administrative Instructions (B.E.P.Q. 499 supplement no. 1 fifth revision) authorising the fumigation with methyl bromide by a method already described [*R.A.E.*, A **27** 591] of plants in boxes or packages not exceeding 14 ins. in diameter at any of the schedules authorised for the treatment of balled and burlapped nursery stock [**30** 174]; the wrapping must not be tightly closed, to facilitate the penetration of the fumigant. Administrative Instructions (B.E.P.Q. 499 supplement no. 4 first revision) authorise the treatment with lead arsenate by a method already described of soil in and round cold frames and plunging beds, etc. [**28** 89] and plants before digging [**28** 90] at the rate of 23 lb. per 1,000 sq. ft. or 1,000 lb. per acre. Subsequent treatment will not be required provided that the concentration of lead arsenate in the soil as determined by chemical analysis is not less than 900 lb. per acre. In Administrative Instructions (B.E.P.Q. 499 supplement no. 5) for the fumigation with paradichlorobenzene between 1st October and 1st May by methods already described [**24** 258; **28** 89] of soil round the roots of plants after digging, the length of time for which the plants must remain undisturbed in the treated soil is reduced to three days.

An Announcement relating to Quarantine no. 72 against species of the subgenus *Graphognathus* of *Pantomorus* [*P. leucoloma*, Boh., and *P. peregrinus*, Buchanan] includes Administrative Instructions (B.E.P.Q. 503 fourth revision supplement no. 1) modifying the schedules authorised for the fumigation of nursery stock with methyl bromide under partial vacuum [**29** 568]. Nursery stock in soil masses not exceeding 16 ins. in diameter when spherical or of such a size that no point within the masses or pots is more than 8 ins. from the nearest point on the surface may now be treated at the rate of 3 or 4 lb. methyl bromide per 1,000 cu. ft. for 1½ hours at temperatures of 75 and 70°F., respectively.

Other information in this part includes supplements to plant-quarantine import restrictions already noticed in Peru and Colombia.

REED (W. D.) & VINZANT (J. P.). **Control of Insects attacking stored Tobacco and Tobacco Products.**—*Circ. U. S. Dep. Agric.* no. 635, 40 pp., 23 figs., 1 ref. Washington, D.C., 1942.

This circular provides up-to-date information on the insect pests of cured tobacco in the United States and their control in warehouses and factories. Details are given of the history of insect infestation in stored tobacco and the losses resulting from it, and of the bionomics of *Lasioderma serricorne*, F., and *Ephestia elutella*, Hb. [*cf. R.A.E.*, A **20** 2; **25** 627], the two most important pests, the types of damage they cause and their natural enemies [*cf.* **31** 9]. Insects that are occasionally collected in cured tobacco and tobacco products include *Catorama tabaci*, Guér., found in the tropics and reported from Florida, which attacks cured tobacco and tobacco seed in much the same manner as *L. serricorne*, *Tlascala finitella*, Wlk., and a number of species that probably act as scavengers or shelter in the tobacco. The ways in which infestation originates in American flue-cured cigarette tobacco, imported cigarette tobaccos, cigar and snuff tobaccos, and tobacco products are described, and its control in open and closed warehouses and factories is discussed. In open warehouses, all doors, ventilators and other openings should be effectively screened [*cf.* **30** 358], suction light-traps should be operated continuously during the flight season of the moths and beetles for the control of *L. serricorne* [*cf.* **23** 713] and to determine the abundance of *E. elutella*, against which pyrethrum powder containing a minimum of 0·8 per cent. pyrethrins should be applied weekly at the rate of 3 oz. per 1,000 cu. ft. of space not occupied by tobacco for as long as the average number of moths caught per trap exceeds about 25 per week, usually from early May until the end of September. The pyrethrum should be applied with a power duster when the weather is calm; it has the disadvantages of leaving an undesirable coating of powder on the containers and of reducing the population only slowly.

The principal method of control in closed warehouses is periodical fumigation with hydrocyanic acid gas. Methods of timing applications by means of catches in light-traps, sealing the buildings, equipping them with piping systems for proper dispersion of the gas, and applying the fumigant are described. A dosage of 10 oz. per 1,000 cu. ft. for 72 hours is considered the most satisfactory, unless infestation is heavy, when it should be increased to 16 oz., and the treatment should be carried out 2–4 times a year. The factors affecting control, including dosage, temperature and exposure, the type of building, and reinfestation owing to the movement of tobacco or the presence of unscreened openings are discussed. Methods are described of fumigating in specially constructed chambers with HCN, obtained from the liquid acid, sodium cyanide and sulphuric acid or calcium cyanide or with carbon bisulphide, at atmospheric pressure, and with HCN, a mixture of ethylene oxide and carbon dioxide (1 : 9), or a mixture of methyl formate and carbon dioxide (15 : 85), in partial vacuum ; the last mixture has given good results with loosely packed bales of tobacco but proved unsatisfactory with tightly packed ones. The dosages required for different types of tobacco are shown.

In tobacco factories, *L. serricorne* and *E. elutella* may be introduced with leaf tobacco from storage or may migrate from warehouses through unscreened windows. Cigarette tobaccos are often subjected to a steaming process under high vacuum, which raises the temperature in the tobacco to at least 160°F. and kills all insects, before being unpacked ; all tobaccos that are not to receive this treatment as soon as they are brought into the factory should be fumigated in atmospheric or vacuum chambers before being taken from storage. All openings should be screened, and suction light-traps should be operated on each floor. Manufactured cigarettes and pipe and plug tobacco should be protected until they are shipped. Unless manufactured cigars are stored at 45–55°F., under which conditions insect infestation is prevented or checked [*cf.* **22** 456], or in insect-proof containers until they are packed and shipped, they should be fumigated in vacuum for four hours with 45 lb. of the mixture of ethylene oxide and carbon dioxide or 50 lb. of the mixture of methyl formate and carbon dioxide per 1,000 cu. ft. before being shipped. All goods returned owing to insect infestation must be fumigated before they are received into the factory.

Notes on the cost of control methods, safeguards to be employed in fumigation, and first aid for persons suffering from hydrocyanic acid poisoning are appended.

FOLSOM (D.). **Potato Virus Disease Studies with Tuber-line Seed Plots and Insects in Maine 1927 to 1938.**—*Bull. Maine agric. Exp. Sta.* no. 410, pp. 215–250, 4 pls., 1 map, 25 refs. Orono, Me., 1942.

The investigations recorded in this paper, in which it was shown that leaf-roll [*Corium solani* of Holmes] spreads more rapidly than other virus diseases of potato in Maine, included a study of the abundance of various insects that might be vectors of these diseases [*cf. R.A.E.*, A **22** 390 ; **29** 188]. Differences in their spread were not shown to be associated with differences in the prevalence of *Empoasca fabae*, Harr. (*mali*, LeB.) and *Lygus oblineatus*, Say (*pratensis*, auct.), and leaf-roll was successfully reduced by roguing in the presence of these insects and of *Epitrix cucumeris*, Harr., and *Leptinotarsa decemlineata*, Say. *Macrosiphum solanifolii*, Ashm., and *Aphis rhamni*, Boy. (*abbreviata*, Patch) transmitted leaf-roll under some experimental conditions, while *Epitrix*, *Leptinotarsa*, *Empoasca* and *Lygus* did not.

WALKER (H. G.) & ANDERSON (L. D.). **Two new Pests of Strawberries, *Acrolophus arcanellus* Clemens and *A. plumifrontellus* Clemens, on the Eastern Shore of Virginia.** (Abstract.)—*Proc. Va Acad. Sci. 1937–38* p. 40. Richmond, Va., 1938. [Recd. 1943.]

Two species of root-feeding webworms, *Acrolophus arcanellus*, Clem., and *A. plumifrontellus*, Clem., seriously injured strawberries 3–5 years old in several fields on the Eastern Shore of Virginia in 1936–37. The larvae live in silken tubes in the soil and feed on the roots and the base of the plants during summer, autumn and early spring. As soon as the berries began to ripen on the plants that survived, the larvae fed on them from below and destroyed their market value. The Tachinids, *Distichona varia*, Wulp, and *Paradidyma singularis*, Tns., were reared from these two Pyralids.

DE BACH (P.) & SMITH (H. S.). **Are Population Oscillations inherent in the Host-parasite Relation ?**—*Ecology* **22** no. 4 pp. 363–369, 1 fig., 9 refs. Brooklyn, N.Y., 1941. [Recd. 1943.]

The following is based on the authors' summary. An almost universal characteristic of animal populations is their tendency to fluctuate about a mean density. These fluctuations or oscillations are in great part the result of regular changes in the physical environment, but many students of populations have postulated that oscillations are also inherent in the interactions of an animal population and that of a specific enemy or disease even in a physically constant environment. To test the soundness of this postulate, populations of puparia of *Musca domestica*, L., and one of its parasites, *Mormoniella vitripennis*, Wlk., were allowed to interact under certain simplified conditions, and the quantitative aspects of the population were determined. The populations of both host and parasite followed closely the theoretical predictions of Nicholson and Bailey [*R.A.E.*, A **21** 369 ; **24** 6] through the equivalent of seven generations. So far as the experiments have gone, they lend strong support to the idea that population oscillations are inherent in the host-parasite or predator-prey interaction. Further study is necessary for complete verification of this theory.

Entomological Section.—*Rep. Dep. Sci. Agric. Barbados 1940–41* pp. 10–12. Barbados [1942].

Work on the major pests of sugar-cane, *Diatraea saccharalis*, F., *Diaprepes abbreviatus*, L., and *Clemora* (*Lachnosterna*) *smithi*, Arr., in Barbados, was continued in 1940–41. The breeding of *Metagonistylum minense*, Tns., introduced against *Diatraea* in 1939 [*cf. R.A.E.*, A **30** 392], was carried out in 1940 and part of 1941, and more than 16,000 fertilised females were liberated in the fields ; a few recoveries have been made, but a survey, begun after harvesting the 1941 crop, has so far given negative results. *Trichogramma minutum*, Ril., was bred and liberated as usual and maintained its normal degree of control [*cf.* **28** 413, etc.]. Investigations on the susceptibility of varieties to infestation by *Diatraea* showed that B. 37161, which is a hard-rind variety of vigorous growth and gives the greatest tonnage and yield of sugar per acre, is also the variety most severely attacked. No effective parasite of *Diaprepes* is known, and the native Scoliid, *Tiphia parallela*, Smith, and the introduced Elaterid predator, *Pyrophorus luminosus*, Ill. [*cf.* **28** 414] give only limited control of *C. smithi* ; it is therefore necessary to destroy the larvae of the pests in the soil by deep forking in cane holes, splitting stumps and ploughing, and to collect the adults by hand. Cane stumps and pieces of dead cane should be removed from the fields to reduce injury by *Eutermes costalis*, Hlmgr., and *Metamasius sericeus*, Ol.

The pink bollworm [*Platyedra gossypiella*, Saund.] was again not observed on cotton [*cf.* **30** 393]. Insect attack resulted in considerable reduction in the yield of sweet potato, but three routine applications of a lead-arsenate spray gave effective control of the scarabee [*Euscepes postfasciatus*, Fairm.] and thrips in plots on five estates. Preliminary field experiments showed that the yield of maize could be increased by the use of control measures against *Laphygma frugiperda*, S. & A., and *Heliothis armigera*, Hb. The introduced termite, *Coptotermes havilandi*, Hlmgr., appears to be the most prevalent and injurious of the species now present in buildings in Bridgetown [*cf.* **29** 6].

Gomes (J. G.). **Subsídios à sistemática dos calcidídeos brasileiros.** [Contributions to the Classification of Brazilian Chalcidoids.]—*Bol. Esc. nac. Agron.* 1941 no. 2 pp. 9–45, 5 pls., 1 fig., refs. Rio de Janeiro, 1942. (With a Summary in English.)

The first two parts of this paper comprise a systematic study of Encyrtid parasites bred from *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.) and *Lecanium* (*Mesolecanium*) *deltae*, Lizer, on *Citrus* in the Federal District of Brazil. The species dealt with are *Aphytis chrysomphali*, Merc., *Aspidiotiphagus lounsburyi*, Berl. & Paoli, *A. citrinus*, Craw, *Marietta costa-limai*, sp. n., which is described from adults of both sexes, and *Signiphora flavopalliata occidentalis*, How., from

C. ficus, and *Metaphycus mauritanicus*, Comp., and *Coccidoxenus brasiliensis*, Gomes [*R.A.E.*, A **30** 504] from *L. deltae*.

The third part contains descriptions of Encyrtids parasitising cockroaches [see B **31** 49].

Rangel (J. F.). **Toxicologia dos inseticidas de ingestão.** [Toxicology of Stomach Poisons.]—*Bol. Esc. nac. Agron.* 1941 no. 2 pp. 149–184, 4 pls., 25 refs. Rio de Janeiro, 1942. (With a Summary in English.)

The author reviews methods that have been used to test stomach insecticides and gives an account of his own technique for administering known doses of insecticides to fourth-instar larvae of *Bombyx mori*, L. He uses Bulger's inlay sandwich method [*R.A.E.*, A **26** 134], modified by cutting the disks from the leaves before dusting, and dusting them in a " settling tower."

Reiniger (C. H.). **Contribuição ao estudo dos possiveis insetos vetores de virus dos " citri " no Brasil.** [A Contribution to the Study of the possible Insect Vectors of a Virus of *Citrus* in Brazil.]—*Bol. Esc. nac. Agron.* 1941 no. 2 pp. 225–245, 6 pls., 2 figs., refs. Rio de Janeiro, 1942. (With a Summary in English.)

A " zonate chlorosis " of *Citrus* occurs in Brazil. Its causal agent has not been determined, and the author suggests that it might be a virus transmitted by an Aphid or a thrips. He quotes descriptions of *Aphis citricidus*, Kirk. (*tavaresi*, Del G.), *Toxoptera aurantii*, Boy., *Heterothrips moreirai*, Moult., *Heliothrips haemorrhoidalis*, Bch., *Frankliniella insularis*, Frankl., *F. rodeos*, Moult., *F. varipes*, Moult., and *Isochaetothrips striatus*, Hood, all of which occur on *Citrus* there, and gives for each species references to the literature, the localities in Brazil where it has been observed, and its alternative food-plants.

Soares (O. M.). **Notas sobre parasitos do tomateiro, contendo a diagnose de *Anaphes tingitiphagus* n. sp. (Himenoptera–Chalcidoidea).** [Notes on Tomato Pests, with a Description of *A. tingitiphagus*, sp. n.]—*Bol. Esc. nac. Agron.* 1941 no. 2 pp. 259–267, 6 pls., 10 refs. Rio de Janeiro, 1942. (With a Summary in English.)

A list is given of the insects that infest tomato in Brazil. The Rhynchota include the Tingids, *Corythaica cyathicollis*, Costa (*planaris*, Uhl.) and *C. monacha*, Stål, of which the differential characters are described. The former is the commoner ; the females insert their eggs partly into the lower surface of the leaves, and the life-cycle lasts 26–32 days, depending largely on temperature. Over 80 per cent. of the eggs of both species were parasitised by a Mymarid described from adults of both sexes as *Anaphes tingitiphagus*, sp. n. Females of this parasite were over four times as numerous as males.

Bondar (G.). **Notas entomológicas da Baía. IX.**—*Rev. Ent.* **13** fasc. 1–2 pp. 1–39, 7 figs., 13 refs. Rio de Janeiro, 1942.

This part of a series on insects in Bahia [*cf. R.A.E.*, A **30** 425] includes descriptions of a new Hispid and several weevils that feed on palms and of *Rhyssomatus landeiroi*, sp. n. The adults of this weevil were found feeding on the tubers, stems and leaves of sweet potato (*Ipomoea batatas*) in the State of Espirito Santo and were also taken in Bahia on an unidentified convolvulaceous plant.

Townsend (C. H. T.). **Possible Fly Parasite of** *Diatraea.*—*Rev. Ent.* **13** fasc. 1–2 pp. 149–150. Rio de Janeiro, 1942.

The Tachinid, *Parkerella parva*, gen. et sp. n., is described from one male and two females bred from puparia found in tunnels of *Diătraea* in fresh maize stalks at Itaquaquecetuba, São Paulo, Brazil. The puparia belonged to a batch of eight found in January 1942, and three others, from which no flies emerged, were found in January 1941. The new genus is close to *Bigonicheta.*

Salmón de los Heros (A.). **El control de la " mosca de la fruta " mediante sus parásitos (lucha biológica).** [Control of the Fruit-fly by Means of its Parasites.]—*Bol. Direcc. Agric. Ganad. Peru* **14** (1940–41) no. 36–43 pp. 149–157. Lima, 1942.

The author reviews work on the biological control of fruit-flies in various parts of the world and concludes that an attempt should be made to introduce suitable parasites against the fruit-flies of the genus *Anastrepha* that occur in Peru.

Wille (J. E.). **Estado sanitario vegetal de Canchaque y Chulucanas.** [The Condition of cultivated Plants in the Districts of Canchaque and Chulucanas.]—*Bol. Direcc. Agric. Ganad. Peru* **14** (1940–41) no. 36–43 pp. 158–164, 4 pls. Lima, 1942.

Records are given of the pests and diseases observed during a tour of inspection in 1941 in two fruit-growing districts in the Department of Piura, north-western Peru. In both, cultural conditions were unsatisfactory and plants were badly neglected, so that attack by pests and diseases was widespread. The more important pests observed included *Selenaspidus articulatus*, Ashm., *Lepidosaphes beckii*, Newm., and *Phyllocoptruta* (*Phyllocoptes*) *oleivorus*, Ashm., on *Citrus*, *Coccus* (*Lecanium*) *hesperidum*, L., on mango, *Leucoptera coffeella*, Guér., on coffee, and *Diatraea saccharalis*, F., on sugar-cane. *C. hesperidum* is controlled by natural enemies.

Wille (J. E.). **La acción tóxica del selenio.** [The toxic Action of Selenium.]—*Bol. Direcc. Agric. Ganad. Peru* **14** (1940–41) no. 36–43 pp. 241–247, 4 graphs, 9 refs. Lima, 1942.

An account is given of experiments in Peru on the effect on *Anomis texana*, Ril., and *Dysdercus ruficollis*, L., of adding selenium to the soil in which cotton is grown. Cotton seedlings were planted in plots containing soil to which sodium selenate was added at rates of approximately 5, 10, 20, 50 and 100 parts selenium per million. The plants that received the two highest dosages died prematurely, and those that received the third were stunted. The others grew normally. The plants of the three groups that survived were infested with larvae of *Anomis* at the beginning of February, when flowering was beginning, and with nymphs and adults of *Dysdercus* in mid-March, when bolls were present. The percentage mortalities for the three treatments (5, 10 and 20 parts selenium) were 90, 100 and 100 in 13, 11 and 8 days for *Anomis* and 30, 73 and 37 in 13 days for *Dysdercus*. The larvae of *Anomis* that survived pupated but the pupae died. The surviving bugs gave rise to viable eggs. In further tests, neither species showed a preference for untreated over treated plants. When seeds from plants treated at the three rates were infested with nymphs and adults of *Dysdercus*, the percentage mortalities were 18, 70 and 82 in 15, 30 and 50 days for the lowest rate, 55, 90 and 100 in 15, 30 and 41 days for the next, and 65, 92 and 97 in 15, 30 and 50 days for the highest. No eggs were laid. It is concluded that the treatment is unsatisfactory against both species, for though the mortality of *Anomis* is high, the larvae survive long enough to cause considerable damage.

Memoria de los trabajos realizados por la Estación de Fitopatología agrícola de La Coruña, año 1941. [The Work of the Phytopathological Station of Corunna in 1941.]—*Publ. Estac. Fitopat. agríc. La Coruña* no. 20, 48 pp., text ill. Corunna, 1942.

A consignment of *Trichogramma* spp. was received from the United States in July 1941 and they were bred in numbers in the laboratory on eggs of *Sitotroga cerealella*, Ol. Aphids identified included *Aphis pomi*, DeG., and *Anuraphis roseus*, Baker (*Yezabura malifoliae*, auct.) on apple, *A. schwartzi*, Börn. (*Brachycaudus amygdali*, Buckt.) on peach, *Macrosiphum* (*Macrosiphoniella*) *sanborni*, Gill., on chrysanthemum, and *Rhopalosiphum nymphaeae*, L., on plum. In a study of the artificial inoculation of the fungus, *Claviceps purpurea* (*Sphacelia segetum*), which causes ergot of rye, various insects were found to be concerned in its spread. These include the Cetoniid, *Oxythyrea funesta*, Poda, and the Telephorids, *Rhagonycha translucida*, Kryn., and *R. fulva*, Scop., which feed on the pollen of rye, and *Bibio hortulanus*, L., and other Diptera, which seek the sweet substance that accompanies the conidia.

BECKER (G.). **Zur Sinnesphysiologie des Hausbockkäfers.** [On the Physiology of the Senses in *Hylotrupes bajulus*.]—*Naturwissenschaften* **30** no. 17–18 pp. 253–256, 5 figs., 5 refs. Berlin, 1942.

Hylotrupes bajulus, L., is one of the most important pests of coniferous timber in Germany. The larvae destroy the sapwood from the time of felling to long after the wood has been used, particularly in roof construction. The eggs, which may amount to 400 per female, are laid in summer in batches in cracks in the timber into which the young larvae bore. Crevices 0·24–0·62 mm. wide are selected for oviposition, and rough wood is preferred to smooth. The fact that only coniferous woods are attacked indicates that the females are guided to them by scent. The larvae cannot develop in the timber of deciduous trees.

In laboratory experiments, 15 essential oils were tested by a technique that is described, but only α-pinene, β-pinene and (to a less degree) one or two others attracted ovipositing females. The placing of these terpenes, or of an oil containing them, such as turpentine, on a wood block always led to oviposition. It is suggested that these substances might be used to induce the females to oviposit in a given place so that infestation of other timber might be prevented. Olfactory stimuli by essential oils of conifers have also been observed in *Ergates faber*, L. [*cf. R.A.E.*, A **30** 615].

NOLL (I.). **Erdflohschaden und Erdflohbekämpfung.** [Injuries due to and Control of Flea-beetles.]—*Kranke Pflanze* **19** pt. 7–8 pp. 67–70, 2 pls. Dresden, 1942.

In Germany the common flea-beetles on cabbage are *Phyllotreta nemorum*, L., *P. undulata*, Kutsch., *P. atra*, F., and *P. nigripes*, F. The control measures advocated are early sowing to enable the seedlings to pass the critical period before the beetles appear, destruction of all cruciferous weeds, the application of repellents, such as road dust or ashes, or of dusts of nicotine, derris or pyrethrum or sprays of nicotine, and the use of mobile traps to catch the adults. Other harmful species are *Psylliodes chrysocephala*, L., on rape, *P.* (*Phyllotreta*) *affinis*, Payk., on potato and tomato, and *Phyllotreta vittula*, Redt., on cereals.

NOLTE (H. W.). **Sexualduftstoffe der Schmetterlinge und Schädlingsbekämpfung.** [Sexual Scents in Lepidoptera and Pest Control.]—*Kranke Pflanze* **19** pt. 7–8 pp. 70–73, 11 refs. Dresden, 1942.

This is a historical note on the use of the scent of unfertilised female moths for attracting and trapping males, originally proposed with the object of leaving many females unfertilised, but subsequently employed mostly as a means for indicating infestation. The method has been used with *Lymantria monacha*, L. [*R.A.E.*, A **30** 540, etc.], the vine moths, *Clysiana* (*Clysia*) *ambiguella*, Hb., and *Polychrosis botrana*, Schiff. [**27** 582], and *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.), and, in the case of *Lymantria* (*Liparis*) *dispar*, L., extracts of the females have also been employed [**28** 36 ; *cf.* also **30** 455].

THALENHORST (W.). **Der Zusammenbruch einer Massenvermehrung von *Diprion pini* L. und seine Ursachen.** [The Collapse of an Outbreak of *D. pini* and its Causes.]—*Z. angew. Ent.* **29** pt. 3 pp. 367–411, 6 figs., 16 refs. Berlin, 1942.

A detailed account is given of observations on the relative abundance of all stages of *Diprion pini*, L., carried out in pine forests in North Germany during the collapse of a general outbreak that began in 1939. They included the overwintering generation of 1939–40, the summer generation of 1940 and the early stages of the second generation of that year. Counts were made of the numbers of all stages on sample areas, and estimates of mortality due to various factors are given.

The following is based on the author's summary. The outbreak began to collapse in the first generation of 1940 owing to destruction of the eggs by parasites (*Achrysocharella ruforum*, Krausse, and *Tetracampe diprioni*, Ferrière) and predacious bugs and of the larvae by disease, and was brought to an end during the egg stage of the second generation by the egg parasites, which had become very numerous, and predacious bugs. Mortality in the cocoon stage represented only a small fraction of the total mortality of the immature stages, so that although parasites, predators and disease kill a high percentage of the cocoon population, they are not of great absolute value. The only abiotic factor concerned in the collapse of the outbreak was extreme exposure to sunshine, which killed many larvae. Outbreaks spread outwards from a centre, and occur in different stages at the same time over small areas.

GOETSCH (W.) & others. **Beiträge zur Bekämpfung von Ameisenstaaten. II. Teil. Untersuchungen 1939/40.** [Contributions to the Control of Ant Colonies. Part 2. Investigations in 1939-40.]—*Z. angew. Ent.* **29** pt. 3 pp. 443–474, 6 graphs, 15 refs. Berlin, 1942.

Further observations are recorded on the effect of various baits offered to ants in artificial nests [*cf. R.A.E.*, A **30** 207]. In investigations on the rejection of baits due to satiety, saccharose (cane sugar) and a mixture of fructose (fruit-sugar) and glucose (grape sugar) were refused after 4 days by *Lasius niger*, L., and after 15 by *Myrmica rubra*, L. When separate solutions of these sugars (each with its distinctive flavour) were offered together, *L. niger* continued to feed for 19 days and *M. rubra* for 21. A protein bait in the form of a fluid nutritive yeast was accepted for 27 days, and satiety had not occurred after 38 days when this bait was alternated with the sugar baits and larvae of *Tenebrio molitor*, L.

In the case of the leaf-cutting ant, *Acromyrmex striatus*, Roger, which takes plant material into its nest, it was repeatedly observed that the fungus beds were tended continuously only if the work of bringing in plant material was stimulated. Lettuce, cabbage and cauliflower were, in decreasing order, attractive for only about 5–7 days, and if they were not replaced by other material, the fungus beds were neglected and allowed to perish. The leaves, shoots and, especially, flowers of rose were accepted for the longest period, and whenever the fungus beds were neglected, it was possible to stimulate transport of plant material by offering rose buds. In this case, the surfeit is due not to overfeeding, but to olfactory and gustatory stimuli, and this may also be true for the other ants.

Stomach poisons in baits acted more quickly on the queens when supplied by the worker ants than when ingested directly, and it appears that the nutritive substances stored in the crop undergo some change there.

Various fungi caused secondary injury to the nests, but the use of entomogenous fungi, such as *Beauveria,* is not advisable, since they constitute a danger to beneficial species, such as *Formica rufa,* L. Secretions from *Kalotermes flavicollis,* F., were lethal to *Lasius* spp., which died in nests that had been previously occupied by the termites, although they had been thoroughly swept out.

JUNG (W.). **Beiträge zur Kenntnis der Lärchenminiermotte** (*Coleophora laricella* **Hb.** [Contributions to the Knowledge of the Larch Case-bearer, *C. laricella.*]—*Z. angew. Ent.* **29** pt. 3 pp. 475–517, 27 figs., 2 pp. refs. Berlin, 1942.

An account is given of observations on the life-history of *Coleophora laricella,* Hb., on *Larix kaempferi* (*leptolepis*) and *L. decidua,* made in Baden, chiefly in 1938, in the course of an outbreak of this Tineid. The immature stages and the larval excreta and cases are described. The moth occurs on larch throughout Germany and has one generation a year. The eggs were laid singly on the needles and hatched in about 8–9 days, from the end of May until the end of July. The larvae mined in the needles immediately on hatching, but left the mines in September and October and formed cases from the needles, in which they over-wintered in groups in sheltered sites, chiefly among the buds of the spur shoots of the outer twigs. They resumed activity between the end of March and early May, formed new cases and fed for about 4–5 weeks by boring into the young needles from their cases. A larva may feed at several points on the same needle or migrate to other needles. Pupation occurred on the tree, chiefly in May, and adults were present from 21st May to the third week in July. Pairing occurred 2–3 days after emergence.

The larvae are little affected by unfavourable weather conditions, but are attacked by parasites and fungi. The trees are resistant to attack, but infestation for several years results in loss of growth and weakens the trees, which become more susceptible to diseases. In extreme cases, the trees are killed by continuous infestation. The severest attacks occur on the southern slopes of low hills and on the sunny side of stands in flat country. Control is difficult, and though effective insecticides exist, their cost renders them uneconomic. Silvicultural practices that increase the resistance of the trees are recommended.

HÖLLDOBLER (K.). **Ueber den Nutzen der roten Waldameise.** [On the Usefulness of the red Forest Ant.]—*Z. angew. Ent.* **29** pt. 3 pp. 518–528, 2 pp. refs. Berlin, 1942.

With reference to the view of Janisch that *Formica rufa,* L., is of small value in the control of insect pests [*R.A.E.*, A **30** 244], the author points out that the different forms of this ant vary in the degree to which they are predacious on forest insects [*cf.* **31** 76] and quotes numerous references in the European literature to its usefulness against *Diprion pini,* L., and *Lymantria monacha,* L.

FISHER (R. C.). **Insect Attack in Japanese Bamboo Poles.**—*Emp. For. J.* **21** no. 1 p. 48, 1 pl., 5 refs. London, 1942.

An investigation of damage to Japanese bamboo after arrival in England showed that holes made by insect borers were common, but that the continued activity of the insects had not been sufficient to necessitate control measures. The most general type of damage was due to Bostrychids of the genus *Dinoderus,* of which *D. minutus,* F., and *D. ocellaris,* Steph. (*pilifrons,* Lesne) have previously been found in Britain. Bamboos imported from Kobe in 1939–40 contained living adults, pupae and larvae of *D. japonicus*, Lesne. In February 1940, living larvae of the Cerambycid, *Chlorophorus annularis*, F., were also found in Japanese bamboo. The presence of this beetle, the larvae of which bore beneath the external rind of the culm, is less easy to detect than that of the Bostrychids, unless exit holes are present.

Kiln sterilisation is an effective means of destroying all borers in bamboo and is of particular value in temperate countries where there is little or no risk of re-infestation. The most suitable combination of temperature and humidity depends on the moisture content of the poles, in order to avoid injury through splitting during subsequent cooling and drying. The duration of the treatment depends upon the thickness of the walls of the culms and the way they are packed in the kiln, but the treatments commonly used for timber infested by *Lyctus* are, in general, applicable [*cf. R.A.E.*, A **25** 669].

CROMBIE (A. C.). **The Effect of Crowding upon the Oviposition of Grain-infesting Insects.**—*J. exp. Biol.* **19** no. 3 pp. 311–340, 5 figs., 36 refs. London, 1942.

This is an account of experiments to determine the effect of competition and population density on oviposition by *Rhizopertha dominica*, F., *Oryzaephilus surinamensis*, L., and *Sitotroga cerealella*, Ol., in wheat or flour, and *Bruchus* (*Acanthoscelides*) *obtectus*, Say, in beans. The experiments were carried out at 30°C. [86°F.] and at a relative humidity of about 70 per cent. The following is substantially the author's summary. The crowding of adults invariably depressed the rate of oviposition, while egg fertility was not affected. In unconditioned media, at densities possible in actual populations, the reduction of fecundity was, it appears, entirely a result of competition for the oviposition sites, usually for two purposes, oviposition and feeding. When two species were in the same environment their effect on each other's fecundity was more or less dependent upon the degree of identity of the niches for which they were competing. The reduction of fecundity of *Rhizopertha* by flour conditioned by its own species or by *Oryzaephilus* or *Sitotroga* was at first roughly proportional to the degree of conditioning, but after a time the effect of all media was the same. It is believed that a conditioned medium operates upon fecundity through "poisoning," and that the effect is upon oviposition rather than, as that of starvation, upon egg-production. When returned to an optimum environment, the insects recovered from all the experimental conditions studied: immediately from overcrowding, more slowly from conditioned media, and more slowly still from complete starvation.

MÉTALNIKOV (S.). **Utilisation des microbes dans la lutte contre les teignes de la farine.**—*C. R. Soc. Biol.* **136** no. 13–14 pp. 503–504, 2 refs. Paris, 1942.

Brief notes are given on the habits of *Ephestia elutella*, Hb., and the damage caused by the larvae in flour. Control measures comprise fumigation and the treatment of walls, floors and beams in the mills with boiling water. The author's experiments have shown that a dust prepared from the dried spores of bacteria that are pathogenic to insects [*cf. R.A.E.*, A **25** 795; **30** 105, etc.] is effective against *E. elutella* and can be applied by means of agricultural dusting equipment. Other caterpillars are readily infected by the spores incorporated in flour, and it is considered probable that insect pests of flour may be successfully controlled by the use of spore dust. The dust retains its effectiveness for several years.

GRESSITT (J. L.). **Destructive long-horned Beetle Borers at Canton, China.**—*Spec. Publ. Lingnan nat. Hist. Surv.* no. 1, 60 pp., 41 figs., 16 refs. Canton, 1942.

This report includes a brief survey of the biology and description of Longicorn beetles and of general measures for their control, and an account of 27 species that were collected and observed on Honam Island, just south of Canton. A key to the known larvae of these species is followed by descriptions and figures of all the adults and some of the immature stages, and brief notes on their food-plants, distribution, bionomics, economic importance and control where these are known.

BEESON (C. F. C.). **The Ecology and Control of the Forest Insects of India and the neighbouring Countries.**—Demy 8vo, [5+] ii+1007 pp., 203 [+2] figs. (incl. 36 pls.), many refs. Dehra Dun, The Author, 1941. Price 25*s*. Also obtainable from the Imperial Forestry Institute, Oxford. [Recd. 1943.]

This handbook contains information on 4,300 insects associated with forests in the Indian region, including, in addition to pests of forest trees and timber, beneficial insects and those that attack man and animals. The species are selected to provide at least one representative of every combination of insect, plant and locality known to occur in Indian forests and to include every species that has been the subject of an enquiry or in which interest has been expressed by an officer of the Indian Empire.

There is a preliminary short survey of the history of forest entomology in the Indian region, including a section by J. C. M. Gardner on the development of systematic entomology, and the remainder of the book is divided into two parts, of which the first (pp. 19–792) deals with the ecology of forest insects and the second (pp. 795–990) with their control. The bulk of the first part comprises information on individual species, varying in scope from a statement of the food-plant to an account of the bionomics, the nature and extent of the injury caused, and the economic importance of the species; in some cases, descriptive notes and distinguishing characters are also given. In addition, there are outlines of the bionomics, etc., characteristic of the various insect Orders and families and notes on the way in which the feeding habits of insects can serve to facilitate their identification and on the economic loss due to insect pests, with special reference to those of forests.

A large section of the second part (pp. 795–867) is devoted to a general account of the reduction in numbers of insects by natural means, including climatic and nutritional factors and natural enemies, and by artificial measures, comprising silvicultural, biological, mechanical and chemical control; a section deals with the control by insects of the noxious weeds, *Opuntia* and *Lantana*. The rest, with the exception of a discussion of the relative importance of insects, fungi, viruses and growth conditions in the dying-off and die-back of the more important timber trees, deals with control measures for specific pests. Brief notes are included on the collection and transport of living and dead insect material.

RAM MOHAN RAO (S.). **Life-history and Bionomics of** *Pseudococcus saccharicola* **Takh. (Homop.-Coccidae)—a new Pest of Sugarcane in India.**—*Proc. Indian Acad. Sci.* Sec. B **16** no. 3 pp. 79–85, 2 pls., 10 refs. Bangalore 1942.

Brief descriptions are given of all stages of *Pseudococcus saccharicola*, Takah., which was originally described from Formosa [*R.A.E.*, A **16** 626] and was observed on sugar-cane and unidentified grasses at Coimbatore in 1939; this is apparently the first record of the mealybug from India. In breeding experiments, the first and second nymphal stages and the prepupal and pupal stages of the male lasted 6–8, 6–7, 2 and 5 days, respectively, and the three nymphal stages of the female 6–8, 6–7 and 6 days; adult males and females survived for 3 and 27 days, respectively. The preoviposition and oviposition periods lasted 12 and 10–12 days. Females deposited 200–300 eggs, with an average of 215, and the egg stage was very short. The mealybugs are gregarious and feed on the distal parts of the leaves, causing discoloration and rolling of the leaf tips and killing young plants; a sooty mould develops on the honeydew. They are tended by *Camponotus compressus*, F., *Solenopsis geminata*, F., and other ants, and the nymphs are parasitised by unidentified Chalcidoids. *Brumus suturalis*, F., is predacious on the nymphs, but affords little control.

CHAKRABORTI (S.). **Preservation of Books affected with Drug-store Beetle and Mildew.**—*Sci. & Cult.* **8** no. 3 p. 141, 1 ref. Calcutta, 1942.

Turkish manuscripts received in New Delhi in March 1942 were found to be infested with the Anobiid, *Gastrallus indicus*, Rttr., and mildew. They were first fumigated in an air-tight chamber with thymol vapour for 72 hours at a temperature higher than 80°F.; the mildew was then removed from them, and they were fumigated with paradichlorobenzene in an air-tight steel cabinet for 10 days. They were subsequently stored with naphthalene flakes. This treatment destroyed the larvae and adults, and no eggs had hatched by July. It did not affect the paper or the ink.

DA COSTA LIMA (A.). **Percevejos de orquídeas (Hemiptera-Miridae-Bryocorinae).** [Bugs infesting Orchids.]—*Orquídea* **4** no. 3 pp. 100–109, 14 figs., 25 refs. Nictheroy, 1942; also in *Bol. Soc. brasil. Agron.* **5** no. 3 pp. 255–264. Rio de Janeiro, 1942. (The latter has a Summary in English.)

The author reviews references in the literature to Capsid bugs of the subfamily BRYOCORINAE infesting orchids and describes the adults of both sexes of *Neoneella zikani*, gen. et sp. n., and *Neofurius carvalhoi*, sp. n., from orchids in Brazil.

GOMES (J. G.). **Segunda contribuição sôbre "** *Trichencyrtus* **" Ashmead, 1904, com a descrição de uma nova espécie (Chalcidoidea-Encyrtidae).** [Second Contribution on *Trichencyrtus*, with a Description of a new Species.]—*Bol. Soc. brasil. Agron.* **5** no. 3 pp. 287–293, 2 figs., 5 refs. Rio de Janeiro, 1942. (With a Summary in English.)

In 1904, Ashmead erected the genus *Trichencyrtus* with *T. chapadae* as the type and later in the same paper he described one new species, *T. robustus*, from a single example from Chapada, Brazil. The author examined specimens of *Trichencyrtus* collected in Brazil and concluded that they comprised two species. Examples of both were compared by Gahan in 1942 with the type specimen of *T. robustus*, and he stated that Ashmead had undoubtedly described as *robustus* the species that he had intended to name *chapadae*, and that *chapadae* should be accepted as having page priority. He also stated that some of the examples submitted to him appeared to represent an undescribed species. The author therefore quotes Ashmead's description of *T. chapadae* (*robustus*) and describes *T. gahani*, sp. n., from males and females from various seeds, including those of *Canavalia ensiformis*, from which this Encyrtid was recorded by Costa Lima as *T. robustus* [*R.A.E.*, A **16** 635].

DE FIGUEIREDO jr. (E. R.). **Uma praga séria das orquídeas**—*Taeniothrips xanthius* **(Williams, 1917).** [A serious Pest of Orchids, *T. xanthius*.]—*Bol. Soc. brasil. Agron.* **5** no. 3 pp. 315–322, 7 figs., 6 refs. Rio de Janeiro, 1942.

Taeniothrips xanthius, Williams, has recently caused serious injury to the leaves of cultivated orchids (*Laelia* and *Cattleya*) in the State of São Paulo, Brazil. The orchids die unless the infestation is controlled. Cory's account of the biology of this thrips [see next abstract] is quoted, and the adult is described. The best insecticide for application in winter was found to be a spray of 1 pint lime-sulphur (32° Bé.) and 1 fl. oz. nicotine sulphate (40 per cent.) in 50 pints water. For summer use, the amount of lime-sulphur should be reduced to ½ or ¾ pint. The spray should be applied every 10 days for 2 months, and should be repeated if rain falls after an application.

CORY (E. N.). **A Thrips injurious to Orchids.**—*Amer. Orchid Soc. Bull.* **9** no. 9 pp. 234–237, 4 figs. Cambridge, Mass., 1941. [Recd. 1943.]

Taeniothrips (*Physothrips*) *xanthius*, Williams, which was described from ornamental orchids in Trinidad [*R.A.E.*, A **5** 502], causes serious injury to seedlings and plants of flowering size in orchid houses in the eastern United States. Heavy infestations reduce flowering capacity, and the plants rarely develop normally until the injured leaves have been removed and the plants re-potted. In *Cattleya* and *Cypripedium*, the punctured leaves become heavily cutinised, the injury to *Cypripedium* being probably the greater as the plants wilt and die more quickly. Lists are given of orchids of other genera that have been more or less severely injured and of those that have not been attacked.

The adult thrips pair soon after emergence, and the females, which are three times as numerous as the males, insert their eggs into the tissue of the leaf; eggs deposited by unfertilised females were found to be viable. The egg, nymphal, prepupal and pupal stages lasted 9, 6, 1 and 3, days, respectively, at 76°F., which was apparently the most favourable temperature. Under experimental conditions, eggs were laid at constant temperatures of 66, 76 and 86°F., but not at 56°F. At 66°F., the egg stage averaged 18 days and the life-cycle 38 days, while at 86°F., the survival rate was low and development was completed in 17 days. In control tests, a spray containing free nicotine scorched the plants at the first application and was discontinued, but satisfactory results were given by several proprietary sprays. *Cattleya* infested by *T. xanthius* and the orchid weevil, *Diorymerellus laevimargo*, Champ., was dusted at weekly intervals with a mixture of equal parts of pyrethrum and talc. Treatment was begun in 1937 and continued up to 1940 at fairly regular intervals, with no reappearance of the thrips and partial control of the weevil.

MCLAINE (L. S.). **Japanese Beetle Situation.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 8–9, 1 fldg. map. Toronto, 1942.

Despite the precautions adopted in Canada since 1930 to prevent the introduction of the Japanese beetle [*Popillia japonica*, Newm.] from the United States [*R.A.E.*, A **28** 419, etc.], adults were collected in Victoria Park, Niagara Falls, in the late summer of 1940. In the summer of 1941, 64 were taken at Niagara Falls and 187 at Windsor, at the other end of Lake Erie. In the spring of that year, the soil over ten acres of the park was treated with lead arsenate at the rate of 500 lb. in 1,000 gals. per acre, and a further 20 acres were treated in September. In view of the satisfactory results obtained from trapping and soil treatment in the United States, instances of which are cited, these measures are to be adopted in Canada; trapping is to be materially extended along the north shore of the St. Lawrence and in the neighbourhood of railway yards and elsewhere where incipient outbreaks are likely to occur. The regulated areas in the north-eastern United States and places outside them where beetles have been trapped, with the number taken at each, are shown on a map.

ARNOTT (D. A.). **Evidences of a second Generation of the European Corn Borer,** *Pyrausta nubilalis* **Hbn., in Ontario.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 9–12, 4 refs. Toronto, 1942.

The European corn borer, *Pyrausta nubilalis*, Hb., was first recorded in Ontario in 1920, and observations during the next ten years indicated that more than 99 per cent. of the population completed only one generation annually. In recent years, however, the proportion producing a second generation appears to have increased in the neighbouring parts of the United States [*R.A.E.*, A **27** 414], and evidence of the occurrence of a small partial second generation at Chatham, in south-western Ontario, was obtained by means of light-traps in 1928–36 [**27** 25]. Catches in a light-trap operated at Chatham each season from 1931 to 1941 provided definite evidence of the occurrence of a second generation, except in 1933, since adults were taken long after the regular flight period had ended. The dates in August, September and October in each year on which adults were trapped and the numbers taken are shown in a table. G. Wishart found that 3·5 per cent. of the larvae along the shore in Essex County had pupated by about midsummer in 1940, and by 24th August 80 per cent. of these had given rise to adults. In 1941, the percentage of the population that pupated in July was 3·1 in the same area and 3·5 in adjacent districts. The maximum was 16 per cent. Pupae and empty pupal cases and immature larvae were collected at a point in Essex county between 23rd and 30th September in 1941, but the second generation represented only 1·1 per cent. of the population. It is thought that the second generation is probably confined to the south-western part of the Province.

THOMPSON (R. W.). **The Corn Borer Situation in Ontario in 1941 with Notes on Hybrid and Broom Corn Infestation.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 12–15, 3 refs. Toronto, 1942.

Infestation of maize by the European corn borer [*Pyrausta nubilalis*, Hb.] in the area in Ontario in which the Corn Borer Act [*R.A.E.*, A **17** 394] is in effect was considerably lower in 1941 than in 1940 [**30** 108], the reduction being as great as 75 per cent. in some districts. This is attributed in part to low rainfall, especially in June and July, but also to greater attention to the thorough destruction of maize refuse and an increased use of hybrids. Most of the losses were to early sweet maize, but the earliest varieties escaped serious injury. The average percentage infestation in each year from 1926 to 1941 is shown for each of 26 counties in a table.

Investigations on the resistance of various strains of maize [*cf.* **30** 108] were continued and 49 standard varieties and hybrids were tested. The average borer population of each strain in 1941 and also in 1938, 1939 and 1940 for those that were tested in these years is shown in a table. Population counts were also made on four varieties of broom corn in small plots. The number of larvae per 100 stalks, which was 12 in two varieties and 15 in a third, was as high as 29 in the fourth, in which stalk breakage was noticeable at some distance.

HAMMOND (G. H.). **The White Grub Situation in Ontario during 1941 and a Forecast for 1942.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 16–18. Toronto, 1942.

Second-year larvae of brood C and adults of brood A of *Lachnosterna* (*Phyllophaga*) spp., each in a distinct area [*cf. R.A.E.*, A **29** 89], were major pests over a large part of Ontario in 1941. The life-cycle lasts three years, and the distribution of infestation was therefore similar to that in 1935 [**25** 367] and 1938 [**28** 425]. Infestation by brood A was light in eastern Ontario, where it was comparable with that in 1938, and in the west, where there was a marked reduction. In central and south-western Ontario, however, the adults caused severe defoliation of ash, oak, poplar and other trees, and large populations of second-year larvae were expected in 1942. As many as 100 or more first-year larvae were present per sq. yd. in meadows and pastures in central Ontario. Brood C was injurious over southern and eastern Quebec and in the Niagara Peninsula and parts of southern and south-western Ontario; the area infested by it represents a continuation in Canada of the large areas in New York State and Michigan covered by the same brood. In south-western Ontario, sugar-beet was seriously damaged, in addition to turf, potatoes, maize and other crops. *L.* (*P.*) *anxia*, Lec., and *L.* (*P.*) *fusca*, Fröl., were the brood C species of importance in southern Ontario; in addition to these, *L.* (*P.*) *rugosa*, Melsh., *L.* (*P.*) *inversa*, Horn, and *L.* (*P.*) *futilis*, Lec., were injurious in the Niagara Peninsula, and *L. rugosa* and *L. futilis* in the south-west.

Notes are given on the incidence of infestation in each district and on cultural and other measures recommended to avoid injury to crops in 1942.

GORHAM (R. P.). **The Progress of the Potato Aphid Survey in New Brunswick and adjacent Provinces.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 18–20. Toronto, 1942.

The results obtained in 1940 and 1941 from the survey of Aphids on potato carried out in eastern Canada since 1934 [*cf. R.A.E.*, A **29** 302] are summarised and discussed. The Aphids taken in each of the four Provinces (New Brunswick, Prince Edward Island, Nova Scotia and eastern Quebec) were *Macrosiphum solanifolii*, Ashm., *Myzus persicae*, Sulz., *Aphis rhamni*, Boy. (*abbreviata*, Patch) and *Macrosiphum solani*, Kalt. (*Myzus pseudosolani*, Theo.). The numbers of fields and of samples in which each species was present are shown for each Province. In 1941, *M. solanifolii* was very widespread in New Brunswick, but was nowhere numerous; in Prince Edward Island and Quebec, fairly severe infestations developed late in August. *Myzus persicae* and *A. rhamni* were the commonest species on potato in New Brunswick and in parts of Prince Edward Island and Quebec.

The winter food-plant of *M. persicae* was found to be wild plum (*Prunus nigra*), on which oviparous females were observed in the autumn of 1940, and Aphids that developed from eggs on branches brought into the laboratory in April 1941 readily colonised potato. Colonies were found on *P. nigra* in the field on 26th May, and it was shown that they would colonise potato. Small clumps of *P. nigra* were found to be present on many farms in four counties in New Brunswick, and the farms on which it was common were those on which *M. persicae* had been taken early in the season in previous years. Winged migrants were first observed on 3rd June, before many potato shoots were above the soil, and they colonised swedes and wild radish near thickets of *P. nigra*. Winged migrants and nymphs were found on potato near *P. nigra* on 16th June, and three days later several nymphs were present on each potato plant. The winged migrants each produced only one nymph on a potato plant and then moved to another. Other plants colonised in spring were cabbage and beet. During the first half of July a dispersal flight from spring food-plants took place, as a result of which late-planted potatoes and wild radish in grain fields near plum thickets became infested. A second and mass dispersal flight, in which *Macrosiphum solanifolii* was also concerned, took place in mid-August [*cf.* **30** 312], and, in districts where there was no wild plum, resulted in the colonisation of potatoes that had not been infested earlier. Another mass flight of *Myzus persicae* occurred in early September; the potato foliage was beginning to die down, and the winged Aphids, many of which were destroyed by a fungous disease, infested many different plants. Relatively few were found on plum late in October, and these gave rise to oviparous females.

Infestations of *A. rhamni* were generally most severe near the winter food-plants, *Rhamnus cathartica*, *R. frangula* and *R. alnifolia* [*cf.* **31** 96]. Eggs were hatching on 1st May, the alates migrated to potato, wild radish and other plants in early June, and the return flight from potato to *Rhamnus* began in the second week in September. Large numbers of eggs were deposited on *R. alnifolia* before the end of September, and oviposition continued on *R. cathartica* and *R. frangula* until well into October.

Matthewman (W. G.), Dustan (A. G.) & Davis (A. C.). **A timing Experiment with Combinations of Mercury Insecticides used for the Control of the Onion Maggot.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 21–23, 4 refs. Toronto, 1942.

During experiments against the onion maggot [*Hylemyia antiqua*, Mg.] in Ontario, it was found that treatment of the seed before sowing with mercurous chloride (calomel) [*R.A.E.*, A **17** 447] checked the initial attack but rapidly lost its effectiveness as the season progressed, and that better control of heavy and medium infestations was given by 2–4 applications of an oil emulsion, a solution of mercury bichloride or a dust containing 4 per cent. mercurous chloride. In experiments in 1940 on combined treatments, the seed treatment, the dust of mercurous chloride and an oil emulsion used separately gave 49, 66 and 43 per cent. control, respectively, but when the last two each followed the seed treatment, the percentages were 93 and 73. In 1941, a timing experiment was conducted according to a modification of a plan proposed by Glasgow [**29** 131]. Treated and untreated seed was sown on 29th April, and the later treatments were begun on 16th May. They comprised 1–3 applications at intervals of 10 days of the dust of mercurous chloride at the rate of 6 oz. per 60 ft. of row, and 1–4 weekly applications of mercury bichloride solution (1 in 1,600) at the rate of $\frac{3}{4}$ gal. per 60 ft. of row. Where the standard recommendations for the spray and the dust (four and two applications, respectively) were combined with the seed treatment, the percentage control was increased from 69 to 90 and from 74 to 92, respectively. Seed treatment alone gave 23 per cent. control. Two applications of mercury bichloride combined with the seed treatment were more effective than four of mercury bichloride alone, provided that the treatment was begun not later than 23rd May, and one application of the dust of mercurous chloride made not later than 16th May and combined with the seed treatment was almost as effective as two applications of the dust alone. The cost of the treatments is discussed.

Beall (G.). **The Tolerance of Larvae of the Tobacco Moth,** *Phlegethontius quinquemaculata* **Haw., to Nicotine.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 24–25. Toronto, 1942.

The experiments described were carried out on fourth-instar larvae of *Protoparce* (*Phlegethontius*) *quinquemaculata*, Haw., collected on tobacco in Ontario soon after they hatched. When solutions of nicotine at concentrations of 2·5, 5 or 10 per cent. were applied to the lower surfaces of pieces of tobacco leaves (4 × 5 ins.), which were then shaken to remove the excess liquid, leaving about 0·4 cc. solution on each piece of leaf, and allowed to dry, all of 14 and 9 larvae fed on leaves coated with 2·5 and 10 per cent. nicotine solution and 24 of 27 fed on leaves coated with 5 per cent. solution reached the prepupal stage. The larvae at first refused the treated leaves, but later fed voraciously, and their excreta became black, indicating that nicotine had passed through them.

Contact toxicity was tested by submerging larvae for 1 minute in solutions varying in concentration from 2·5 to 40 per cent. nicotine, placing them on blotting paper, to absorb the excess, and transferring them to untreated tobacco leaves. Only 2 of 20 and 4 of 18 larvae submerged in the 20 and 40 per cent. solutions, respectively, reached the prepupal stage; at concentrations of 2·5, 5 and 10 per cent., all of 4, 4 of 9 and 11 of 16 larvae survived, respectively. Contact with nicotine caused most of the larvae to become limp and paralysed. Some that recovered from this condition were unable to moult successfully, but those that did so gave rise to normal prepupae.

Wishart (G.). **Observations on the Rise in Temperature due to Metabolism in Cultures of the Mediterranean Flour Moth,** *Ephestia kuehniella* **Zell.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 25–26, 1 graph, 2 refs. Toronto, 1942.

The author points out that experiments recorded in papers already noticed [*R.A.E.*, A **22** 159; **24** 819], from which it was concluded that almost all the males of *Ephestia kuehniella*, Zell., are infertile at 30°C. [86°F.] and a high proportion at 27°C. [28·6°F.], and that spermatogenesis is considerably retarded at 30°C., were carried out on insects from cultures maintained at the temperatures under investigation. The effect of any increase in the temperature of the culture itself, owing to metabolic activity, appears to have been neglected. To ascertain whether any such increase does occur, cultures of *Ephestia* were established in cardboard boxes 6×6×1 in. containing a ½-inch layer of whole-wheat flour, near the surface of which was a thermocouple junction. These dimensions provided ample opportunity for the radiation of heat from the culture. The boxes were kept at a constant temperature of 23°C. [73·4°F.], and 750, 1,500 or 3,000 eggs were placed on the flour.

The results are shown in graphs. The temperature increased in all three cultures containing larvae, but not in the control, and the increase was related to the density of the larvae. The greatest rise in temperature was 5·7°C. [10·26°F.], which occurred after 28 days in the 3,000-egg culture, but that in the 750-egg culture rose by 1·6°C. [2·9°F.] when the larvae were in the fifth instar. Most heat was produced during the growing period between ecdyses, particularly in the later instars, which corresponds approximately to the time during which the male gonads are formed. The author concludes that existing data on the influence of temperature on the fertility of *Ephestia* are valid only when the insects were reared singly or in very sparse cultures.

COPELAND (C.) & MESSER (C. R.). **Scouting for the European Earwig,** *Forficula auricularia* **L. in Ontario, 1938 to 1941.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 27–29. Toronto, 1942.

Forficula auricularia, L., was discovered in a village in Ontario in 1938 [*cf.* *R.A.E.*, A **27** 601 ; **29** 304], and 38 other infestations were found in the next three years. They occurred in a relatively narrow area some 16 miles long, and it is not considered likely that any general infestation exists outside it. Infestation has been reduced in the original village, in which baits were applied [*cf.* next abstract]. On a farm that was heavily infested in 1939, only ten earwigs were taken in 6 traps in 1941, although no baits had been distributed, but infestations were found at five places in the immediate vicinity. Undulating country on gravel soil appears to be the most favourable for infestation. The infested zone is bounded on the east largely by a swampy area, which is likely to check spread in that direction, and no produce in which earwigs might be carried is exported from it. The adults appear to need some protection during the winter, since most have been found near buildings, but large numbers have also occurred in stooked grain on remote parts of farms.

MCNALLY (A. G.). **Note on Municipal Baiting Campaign against the European Earwig,** *Forficula auricularia*, **at Ayton, Ontario.**—*72nd Rep. ent. Soc. Ont. 1941* p. 29, 1 ref. Toronto, 1942.

Infestation by *Forficula auricularia*, L., in the village in Ontario in which experimental baits were applied in 1939 [*R.A.E.*, A **29** 304] was light in 1940 and control measures were discontinued, but a heavy infestation was discovered there in the early summer of 1941, and bait was distributed throughout the village on 4th and 17th July. Although cool weather followed the first and light rain the second application, good practical control was obtained. In a neighbouring village with a comparable initial infestation in which bait was not used, heavy infestation persisted.

ARMAND (J. E.). **Thermal Preference by Pharaoh's Ant,** *Monomorium pharaonis* **(L.), as a Guide in Control Work.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 30–32. Toronto, 1942.

Observations in Ontario on *Monomorium pharaonis*, L., carried out during an outbreak that occurred in a two-storey basement building, indicated that the ants were largely restricted to the area surrounding the hot-water system, to which they were attracted by the warmth. They apparently require a high temperature, preferably between 80 and 86°F., for establishing nests and travelling in search of food.

LORD (F. T.). **The relative Susceptibility of the Sexes of** *Drosophila melanogaster* **Meigh., to Nicotine (Alkaloid) used as Contact Insecticide.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 32–34, 1 ref. Toronto, 1942.

Experiments in connection with the use of *Drosophila melanogaster*, Mg., for tests of contact insecticides [*cf. R.A.E.*, A **29** 311] indicated that the mortality of adults caused by nicotine was greater in males than females and varied with the proportion of yeast in the medium on which the flies were reared. Suggestions are made for equalising the sex ratio among adults used in spraying tests.

MAXWELL (C. W. B.). **Some recent Experiments on the Control of the Strawberry Weevil** *Anthonomus signatus* **Say.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 35–39. Toronto, 1942.

Since a dust of lead arsenate and sulphur (15 : 85), which is effective against *Anthonomus signatus*, Say, on strawberry in some parts of North America [*cf. R.A.E.*, A **28** 519, etc.], has not proved satisfactory in the Maritime Provinces of Canada, field tests on alternative dusts were carried out in New Brunswick in 1939–41. Evidence was obtained that most of the weevils hibernate in strawberry and raspberry plantations, since they were found in spring in trap cages that had been set up in autumn in strawberry plantations, and were not found in similar cages in pastures and other places close by, and large numbers occurred in the débris at the base of raspberry canes in late autumn and early spring. The weevils do not normally feed on plants other than raspberry or strawberry, although they survived in the laboratory when fed on various flowering plants. Strawberry plantations are usually most heavily infested in their second year, probably owing to the survival of populations built up during the previous year, and in some cases to migration from new plantations in which the buds develop later.

The mixtures used in the dusting experiments were applied at the rate of 50 lb. per acre, and the tests in 1939 showed that pyrethrum with gypsum (30 : 70) and synthetic cryolite with gypsum or sulphur (30 : 70 and 15 : 85) were more effective than the mixture of sulphur and lead arsenate. There was little difference in the effectiveness of cryolite and the more expensive pyrethrum, and gypsum seemed as good a carrier for it as sulphur. Further tests in 1940 confirmed the value of gypsum as a diluent for cryolite and indicated that undiluted synthetic cryolite was more effective than the natural material, which was too heavy for satisfactory application without a carrier. In 1941 the dusts were applied on 30th May or 2nd June. The percentages of buds cut by the weevils averaged 27·2 for lead arsenate and sulphur (15 : 85), 13·1 and 16·2 for synthetic and natural cryolite and gypsum (30 : 70), 20·8 for each cryolite and gypsum (15 : 85), 16·4, 13·8 and 12·4 for undiluted synthetic cryolite at 20, 40 and 60 lb. per acre, respectively, and 31·5 on untreated plots.

CAESAR (L.). **Notes on the Egg Masses of the White-marked Tussock Moth.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 39–40. Toronto, 1942.

The overwintering egg-masses of *Hemerocampa leucostigma*, S. & A., are sometimes removed from trees after the leaves have fallen as a control measure, and the viability of eggs in masses that are allowed to remain on the ground throughout the winter was therefore investigated in Ontario. In the autumn of 1940 the percentages of eggs that hatched were high (76) if they were exposed and lower if they were sheltered in various ways. It appeared that the principal factor influencing hatching was the amount of moisture in contact with the eggs and that the increased hatch from masses left exposed was due to the disintegration by rain and melting snow of the material binding the eggs together, which left the eggs loose. The use of a stiff wire brush to tear the egg-masses from the trees would not therefore appear to be of any great value. In view of these results, the application of creosote or creosote oil coloured with lampblack to the egg-masses appears to be the most satisfactory measure.

WILKES (A.). **Notes on the Laboratory Propagation of three European Species of *Exenterus* (Ichneumonidae), parasitic on Sawflies.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 41–44, 2 figs., 3 refs. Toronto, 1942.

In view of the importance of continuing the liberation of the European Ichneumonids, *Exenterus marginatorius*, F., *E. claripennis*, Thoms., and *E. abruptorius*, Thnb., against sawflies in Canada, an attempt was made in 1941 to develop a technique for rearing them, since further supplies cannot be obtained from Europe and the great reduction in the population of *Gilpinia hercyniae*, Htg., on spruce has rendered the collection of parasitised material for redistribution too costly. The hosts used were larvae of *Neodiprion abietis*, Harr., *N. dubiosus*, Schedl, *N. sertifer*, Geoffr., *N. lecontei*, Fitch, *Diprion similis*, Htg., *G. hercyniae* and a species of *Neodiprion* from jack pine [*Pinus banksiana*] ; all the parasites oviposited on all these hosts, and 4 generations of the first two were reared, but the first generation of *E. abruptorius* was not completed at the time of writing, since all the prepupae diapaused.

In the method adopted, mated female parasites were placed in small cotton gauze cages with celluloid fronts together with last-instar host larvae ; when oviposition had taken place, the parasitised larvae were transferred to damp sphagnum moss in which they constructed their cocoons, and each cocoon was then placed in a separate vial and maintained at 74°F. and 80 per cent. relative humidity until the adult parasites emerged (20–30 days). About 12 per cent. of the parasitised larvae failed to form cocoons, and this is attributed to insufficient moisture in the moss.

The results of the work are shown in a table. About 55–68 per cent. of *E. marginatorius* and *E. claripennis* diapaused, and there was no difference in the sexes in this respect. Males represented rather less than 50 per cent. of the offspring of mated females and all the offspring of unpaired ones. The mean longevity of adults kept in cloth-covered cages and fed daily on a 10 per cent. solution of honey was 54 days for *E. claripennis*, 40 days for *E. marginatorius*, and 20 days for *E. abruptorius* ; several females of the first two species survived for more than 13 weeks. Females of all three oviposited freely about 24 hours after mating ; not more than two eggs are deposited daily, and several females laid one egg each day for two months. The total number of eggs deposited by females of *E. abruptorius*. *E. marginatorius* and *E. claripennis* averaged 31, 21 and 12, respectively, but some females of each species laid over 80 eggs. Males mated most effectively 7–8 days and females 2–24 hours after emergence, but some females paired successfully 2–3 days after they had emerged. The parasites could be induced to mate only under limited conditions. The optimum environment appeared to be near or on the edge of bright sunlight at a changing temperature between 67 and 80°F. Mating was best obtained in the laboratory by raising the temperature in which the cages were placed from 60 to 80°F. at the rate of approximately 1° in 8 minutes. The sexes were segregated until required for mating and kept in a dark room at about 60°F. ; they were allowed to feed each day for about an hour under ordinary room conditions.

BROWN (A. W. A.). **Annual Report of the Forest Insect Survey 1941.**—23 pp., 9 maps, 1 ref. Ottawa, Dep. Agric. Canada, 1942.

An account is given of the work of the Forest Insect Survey in Canada [*cf.* *R.A.E.*, A **30** 313, etc.] during 1941. The area covered was again extended, and 11,326 samples were received during the year. Notes are given on the incidence of some 60 species of forest pests arranged according to their food-plants, and records of 78 less important pests are shown in a table. The outstanding species was *Harmologa* (*Cacoecia*) *fumiferana*, Clem., which continued to be injurious to balsam fir [*Abies balsamea*] in northern Ontario, where the range of the outbreak was extended, and was common throughout Quebec and in north-western New Brunswick. In Manitoba, an outbreak of medium intensity was discovered on white spruce [*Picea glauca*], and there was no decrease in the intensity of the infestations on spruce and larch recorded in 1940. Other important pests were *Gilpinia hercyniae*, Htg., on spruce [**30** 464], *Agrilus anxius*, Gory, and *Bucculatrix canadensisella*, Chamb., on birch, the biological race of *H. fumiferana* that attacks jack pine [*Pinus banksiana*], and *Pristiphora erichsoni*, Htg., on larch. The distribution of light, medium and heavy infestation of these and also of *Malacosoma disstria*, Hb., on poplar, and *Cryptococcus fagi*, Baer., on beech are shown on maps. There was a marked increase in the prevalence of Aphids, particularly *Chermes* (*Adelges*) *abietis*, L., on spruce.

MAHEUX (G.) & GAUTHIER (G.). **La nymphose de** *Pyrausta nubilalis* **Hbn. en fonction de l'état du sol.** (Abstract.)—*Trans. roy. Soc. Can.* (3) **36** *Min. Proc.* p. 161. Ottawa, 1942.

The survival of *Pyrausta nubilalis*, Hb., in spite of control measures, is due to its power of adaptation at the moment of pupation. Experiments show that larvae buried at various depths in the soil come to the surface and 58·7 per cent. succeed in pupating if vegetable débris is available, while 43·7 per cent. pupate in earthen cocoons if it is not.

VANCE (A. M.). **Estimates of Damage to Corn by the European Corn Borer in 1941.**—*Insect Pest Surv. Bull.* **22** no. 3 (suppl.) pp. 63–65. Washington, D.C., 1942.

From a survey made in the north-east of the United States in 1941, it is estimated that the loss due to damage by *Heliothis armigera*, Hb., in 258 counties in 18 States amounted to more than 4¼ million dollars in approximately 7½ million acres of maize harvested for grain and more than 675 thousand dollars in nearly 169 thousand acres of sweet maize. Losses over a large part of the infested area extending eastward from Indiana to the Atlantic coast were much lower than in the previous year, corresponding to a general decrease in abundance of *H. armigera*. Over 80 per cent. of the total loss of maize harvested for grain occurred in the extensive areas surveyed in Ohio and Indiana, where the moth either continued to be abundant or had increased appreciably, and as a result of this, the total damage to grain maize in 1941 slightly exceeded that in 1940.

WALKER (M. G.). **A mathematical Analysis of the Distribution in Maize of** *Heliothis armigera* **Hb.** (*obsoleta* **F.**).—*Canad. J. Res.* (D) **20** no. 8 pp. 235–261, 7 figs., 5 refs. Ottawa, 1942.

The author discusses and analyses the distribution of the eggs of *Heliothis armigera*, Hb., among maize plants, on the basis of two counts made at an interval of one week by J. Marshall [at Barberton, South Africa (*R.A.E.*, A **24** 442)], in relation to the connection between the state of development of maize plants and their attractiveness to ovipositing moths found by F. S. Parsons and G. C. Ullyett [at Barberton (**22** 225, 676)]. Although the actual frequency distribution of the eggs suggests a random as opposed to a uniform distribution, the conditions required for a pure mathematical random distribution cannot be satisfied, since the plants differ from one another in absolute degree of attractiveness at any one time and in relative degree of attractiveness with the passing of time. It is demonstrated, however, that a mathematical theory of random distribution, adjusted to include the concept of the non-uniformity of the plants, gives a fairly good representation of the egg distribution found in the field. Two methods of calculating theoretical distributions to fit the data are shown; one is a discontinuous process, which is presented as only a rough approximation, and the other involves the use of a compound Poisson series.

SMITH (R. H.). **Sycamore Scale in California.**—*Pacif. rur. Pr.* **141** no. 12 p. 439. San Francisco, 1941. (Abstr. no. 5635 in *Biol. Abstr.* **16** no. 2. Philadelphia, Pa., 1942.)

The most injurious insect attacking the foliage of sycamore (*Platanus*) in California is the Coccid, *Stomacoccus platani*, Ferris, which has several generations annually and has caused increasing damage during the last ten years throughout the State, both in the interior and in the cooler coastal areas. The oriental sycamore [*P. orientalis*] is much more heavily attacked than the native *P. racemosa*. Severely infested young leaves become malformed and are shed prematurely. The most effective control measure is the application of a dormant oil emulsion (3 : 100) in January, but spraying in spring and summer gives a considerable degree of control if carried out when the insects of a generation are established on the leaves.

STRUBLE (G. R.). **Biology of two native Coleopterous Predators of the Mountain Pine Beetle in Sugar Pine.**—*Pan-Pacif. Ent.* **18** no. 3 pp. 97–107, 1 pl., 2 figs., 6 refs. San Francisco, Calif., 1942.

Temnochila virescens, F., and *Enoclerus sphegeus*, F., are predacious on Coleoptera that infest the bark and wood of forest trees in the western United States, and particularly on Scolytids in pines. They appear to be of importance in the control of *Dendroctonus monticolae*, Hopk., in sugar-pine [*Pinus lambertiana*], and an account is given of the results of investigations on their bionomics in relation to this bark-beetle, carried out in 1937–40 in the central Sierra Nevada Mountains (California).

The following is based on the author's summary. Both predators require a year to complete their life-cycle, but *Temnochila* develops on the summer generation of the Scolytid and *Enoclerus* on the winter one. The larvae prey on the immature stages and the adults on the mature adults. *Temnochila* oviposits from May to September, and the larvae prey on the Scolytid until the adults emerge from the trees in the latter month and then complete their development on secondary insects present beneath the bark. *Enoclerus* oviposits in warm weather in autumn and spring, and the larvae complete their development and migrate to the base of the tree when the adult Scolytids begin their flight in June. They pupate in August, and the adults emerge during September–November. These predators have no important natural enemies, but each preys on its own species.

KNOWLTON (G. F.). *Amphorophora osborni* (**Homoptera, Aphididae**).—*Pan-Pacif. Ent.* **18** no. 3 p. 143, 1 fig. San Francisco, Calif., 1942.

The author describes the apterous vivipara of *Amphorophora osborni*, sp. n., which was collected in Utah in June 1935 on *Ribes longiflorum* together with *A. ribiella*, Davis, which it somewhat resembles.

MILLS (W. D.) & EVANS (J. A.). **Spray and Dust Schedules for protecting Orchard Crops from Diseases and Insects.**—*Cornell Ext. Bull.* no. 473, 27 pp., 7 figs. Ithaca, N.Y., N.Y. St. Coll. Agric., 1942.

This bulletin, which supplements two earlier ones [*R.A.E.*, A **23** 240; **30** 560, etc.], contains a condensed account of practical methods of controlling pests and diseases in orchards in New York by means of sprays and dusts, and includes changes in the recommendations given, based on the results of experiments carried out during 1941.

NEW SOUTH WALES. **Plant Diseases Act, 1924.—Proclamation.**—*Govt. Gaz.* no. 138, repr. 1 p. Sydney, 16th October 1942.

This proclamation revokes previous ones regarding fruit-fly control in New South Wales and requires every owner and occupier of land to take the following measures: collect all infested and fallen fruit from fruit trees of 22 specified kinds at intervals not exceeding 3 days; remove all main-crop seville oranges and all mandarins of 8 specified varieties not later than 31st October in each year, all intermediate crop seville oranges not later than 31st December, and all loquats not later than 31st October in 33 specified counties and 15th December in the rest of the State; dispose of all waste or infested fruit immediately by burning, immersion in boiling water for at least 10 minutes, or placing in a covered pit that prevents the escape of fruit-flies [*cf. R.A.E.*, A **30** 370, etc.]; and spray all fruit trees of 15 specified kinds weekly with a foliage spray of 2 oz. sodium fluosilicate or tartar emetic and 2½ lb. white sugar dissolved in 4 gals. water at the rate of at least 6 fl. oz. for each tree, beginning the treatment on each variety five weeks before the normal date of ripening and continuing it until all the fruit of that variety is removed from the trees and for a further month in the case of the variety from which the fruit is last removed.

PAPERS NOTICED BY TITLE ONLY.

IMPERIAL INSTITUTE. **Quarterly Bibliography on Insecticide Materials of Vegetable Origin, Nos. 9–20 (November 1939 to September 1942).**—*Bull. imp. Inst.* **38** nos. 1–4 pp. 62–65, 203–208, 346–352, 447–452; **39** nos. 1–4 pp. 41–48, 143–147, 269–275, 391–396; **40** nos. 1–4 pp. 28–33, 131–137, 199–206, 282–289. London, 1940–42. [*Cf. R.A.E.*, A **28** 136.]

BRIGHTWELL (S. T. P.). **Fumigation by Smokes** [Aerosols] **with special Reference to Derris and Pyrethrum. A Survey of recent Literature.**—*Bull. imp. Inst.* **40** no. 1 pp. 6–11, 30 refs. London, 1942.

ROY (D. N.) & GHOSH (S. M.). **A new active Constituent of Pyrethrum Flower.**—*Nature* **150** no. 3796 p. 153, 1 graph, 2 refs. London, 1942. [See *R.A.E.*, B **31** 47.]

TWINN (C. R.). **A Summary of the more important Crop Pests in Canada in 1941.**—*72nd Rep. ent. Soc. Ont. 1941* pp. 47–56. Toronto, 1942.

FLANDERS (S. E.). **The larval Meconium of parasitic Hymenoptera as a Sign of the Species.**—*J. econ. Ent.* **35** no. 3 pp. 456–457, 9 refs. Menasha, Wis., 1942.

GONÇALVES (C. R.). **Contribuição para o conhecimento do gênero** *Atta* **Fabr., das formigas saúvas.** [A Revision of the Genus *Atta*.]—*Bol. Soc. brasil. Agron.* **5** no. 3 pp. 333–358, 13 figs., 37 refs. Rio de Janeiro, 1942.

VAN EMDEN (F. I.). **Larvae of British Beetles. III. Keys to the Families.**—*Ent. mon. Mag.* **78** nos. 940–943 pp. 206–226, 253–272, 54 figs., refs. London, 1942. [*Cf. R.A.E.*, A **29** 480.]

AUDCENT (H.). **A preliminary List of the Hosts of some British Tachinidae (Dipt.).**—*Trans. Soc. Brit. Ent.* **8** pt. 1 pp. 1–42, 7 pp. refs. Parkstone, Dorset, 1942.

NOTICES.

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